Higher Maths Key Steps and Exam Strategies

Rigour Maths

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Unit 1

Unit 2

Unit 3

Emergency Exam Strategies

The following booklet will show you the key steps how to answer the "standard" questions in the Higher Maths course. It is by no means a list of EVERYTHING but it aims to provide you with a solid foundation to go on and achieve a good pass.

Only underlined skills have key steps so far

Higher Maths Key Steps and Exam Strategies

Straight Line

1. Distance between 2 points
2. Midpoint
3. Gradient when given an angle
4. Perpendicular gradient
5. Collinearity
6. Median
7. Altitude
8. Perpendicular bisector
9. Point of intersection between 2 straight lines

Differentiation

1. Rate of change
2. Gradient of tangent to curve
3. Equation of tangent to curve
4. Calculating point when given the gradient
5. Stationary points
6. Curve sketching
7. Graph of f'(x)

Recurrence Relations

1. Calculating terms
2. Finding the limit
3. Finding the values of a and b

Functions

1. f(g(x))
2. Restrictions on the domain
3. Inverse functions

Graphs of functions

1. Identifying features on trig graphs
2. Changing to radians
3. Graphs of inverse functions

Unit 1

Unit 2

Unit 3

Higher Maths Key Steps and Exam Strategies

Quadratics

1. Writing the equation of a quadratic/cubic
2. Completing the square
3. Quadratic inequalities
4. Solving for no real/equal/real roots
5. Points of intersection between a curve and a straight line

Integration

1. Differential equations
2. Definite Integrals
3. Shaded area

Trigonometry

1. Finding sin2x
2. Finding cos2x
3. Solving "type 1" trig equations
4. Solving "type 2" trig equations
5. Solving "type 3" trig equations

Circles

1. Centre and radius for $(x - a)^2 + (y-b)^2$
2. Centre and radius for $x^2 + y^2 + 2gx + 2fy + c = 0$
3. Equation of tangent to a circle
4. Show that a line is a tangent/ intersects/ does not intersect a circle
5. Intersecting circles

Unit 1

Unit 2

Unit 3

Polynomials

1. Factorising a polynomial
2. Finding missing terms in a polynomial
3. Finding the values of a and b

Higher Maths Key Steps and Exam Strategies

Vectors

1. Collinearity
2. Finding a point when given the ratio
3. Perpendicular vectors
4. Finding the components of a vector parallel to a unit vector
5. Finding the angle between two vectors

Logs and Exponentials

1. Simplifying log expressions
2. Solving log equations
3. Exponential equations
4. Equations in the form $y = a^x$, $y = ka^x$ and $y = kx^n$

The Wave Function

1. Writing trigonometric expressions in the form $k\sin(x + a)^\circ$

Further Calculus

1. Further differentiation
2. Further integration

Unit 1

Unit 2

Unit 3

Higher Maths Key Steps and Exam Strategies

If there is a question that you feel you have never seen before (assuming you have studied properly!) try the following…one of them will almost certainly work!

1

2

3

4

Higher Maths Key Steps and Exam Strategies

If there is a question that you feel you have never seen before (assuming you have studied properly!) try the following…one of them will almost certainly work!

1. Differentiate

2. Set them equal (if given 2 things!)

3. Set = 0 (then factorise!)

If given a point and an equation…

4. Sub the point in!

Since all of these words mean differentiate!

- f′(x)
- $\frac{dy}{dx}$
- Rate of Change
- Stationary
- Maximum/Minimum
- Increasing/Decreasing
- Greatest/Least
- Velocity/Acceleration
- Tangent to Curve

Higher Maths Key Steps and Exam Strategies

How do you find the distance between 2 points?

1

Higher Maths Key Steps and Exam Strategies

How do you find the distance between 2 points?

1 Draw a triangle and use Pythagoras

Click here to reveal answer!

Now try it yourself!

Calculate the length of the line joining (-2, -8) and (5, -3).

Higher Maths Key Steps and Exam Strategies

How do you find the distance between 2 points?

1 Draw a triangle and use Pythagoras

Now try it yourself!

Calculate the length of the line joining (-2, -8) and (5, -3).

Answer: distance = $\sqrt{74}$

Higher Maths Key Steps and Exam Strategies

How do you find the Midpoint of a line?

1

Higher Maths Key Steps and Exam Strategies

How do you find the Midpoint of a line?

1. Add them and half them

Click here to reveal answer!

Now try it yourself!

Find the midpoint of the line passing through (-9, 5) and (-1, -3).

Higher Maths Key Steps and Exam Strategies

How do you find the Midpoint of a line?

1 Add them and half them

Now try it yourself!

Find the midpoint of the line passing through (-9, 5) and (-1, -3).

Answer: M(-5, 1)

Higher Maths Key Steps and Exam Strategies

How do you find a perpendicular gradient?

1

Higher Maths Key Steps and Exam Strategies

How do you find a perpendicular gradient?

Click here to reveal answer!

1 Turn it upside down and change the sign.

Now try it yourself!

Find the equation of the straight line which is perpendicular to the line with equation $5x + 2y = 3$ and which passes through the point $(1, 6)$.

Higher Maths Key Steps and Exam Strategies

How do you find a perpendicular gradient?

1. Turn it upside down and change the sign.

Now try it yourself!

Find the equation of the straight line which is perpendicular to the line with equation $5x + 2y = 3$ and which passes through the point $(1, 6)$.

Answer: $y - 6 = \frac{2}{5}(x - 1)$

Higher Maths Key Steps and Exam Strategies

How do you show that the 2D points A, B and C are collinear?

1

2

3

Higher Maths Key Steps and Exam Strategies

How do you show that the 2D points A, B and C are collinear?

1. Calculate m_{AB}
2. Calculate m_{BC}
3. Write statement

Now try it yourself!

Prove that the points A(-2, -8), B(0, -4) and C(7, 10) are collinear.

Click here to reveal answer!

How do you show that the 2D points A, B and C are collinear?

1. Calculate m_{AB}
2. Calculate m_{BC}
3. Write statement

Now try it yourself!

Prove that the points A(-2, -8), B(0, -4) and C(7, 10) are collinear.

Answer: Since $m_{AB} = m_{BC}$ ($m = 2$) and B is a common point, A, B and C are collinear.

Higher Maths Key Steps and Exam Strategies

In the triangle ABC how do you find the equation of the median from B?

1

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In the triangle ABC how do you find the equation of the median from B?

1. Find the Midpoint of AC
2. Calculate m_{BM}
3. y – b... (Using m_{BM} and B or M)

Now try it yourself!

Triangle ABC has vertices A(2, -4), B(5, 3) and C(6, 0).

Calculate the equation of the median from B.

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

In the triangle ABC how do you find the equation of the median from B?

1. Find the Midpoint of AC
2. Calculate m_{BM}
3. y – b... (Using m_{BM} and B or M)

Now try it yourself!

Triangle ABC has vertices A(2, -4), B(5, 3) and C(6, 0).

Calculate the equation of the median from B.

Answer: $y = 5x - 21$

Higher Maths Key Steps and Exam Strategies

In the triangle PQR how do you find the equation of the altitude from R?

1

2

3

Higher Maths Key Steps and Exam Strategies

In the triangle PQR how do you find the equation of the altitude from R?

1. Calculate m_{PQ}
2. m_{perp}
3. y – b... (Using m_{perp} and R)

Now try it yourself!

Triangle PQR has vertices P(-5, -1), Q(1, 2) and R(6, -4).

Calculate the equation of the altitude from R.

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

In the triangle PQR how do you find the equation of the altitude from R?

1. Calculate m_{PQ}
2. m_{perp}
3. y – b... (Using m_{perp} and R)

Now try it yourself!

Triangle PQR has vertices P(-5, -1), Q(1, 2) and R(6, -4).

Calculate the equation of the altitude from R.

Answer: $y = -2x + 8$

Higher Maths Key Steps and Exam Strategies

How do you find the equation of the perpendicular bisector of RT?

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Higher Maths Key Steps and Exam Strategies

How do you find the equation of the perpendicular bisector of RT?

Click here to reveal answer!

Now try it yourself!

Triangle RST has vertices R(-2, -1), S(1, 7) and T(8, -3).

Calculate the equation of the perpendicular bisector of RT.

1. Find the Midpoint of RT
2. m_{RT}
3. m_{perp}
4. y – b... (Using m_{perp} and M)

Higher Maths Key Steps and Exam Strategies

How do you find the equation of the perpendicular bisector of RT?

1. Find the Midpoint of RT
2. m_{RT}
3. m_{perp}
4. y – b... (Using m_{perp} and M)

Now try it yourself!

Triangle RST has vertices R(-2, -1), S(1, 7) and T(8, -3).

Calculate the equation of the perpendicular bisector of RT.

Answer: $y = 5x - 17$

Higher Maths Key Steps and Exam Strategies

How do you calculate the inverse function of f(x)?

1

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Higher Maths Key Steps and Exam Strategies

How do you calculate the inverse function of f(x)?

Click here to reveal answer!

Now try it yourself!

A function is given by $f(x) = 7x + 3$.

Find the inverse function $f^{-1}(x)$.

1. Replace f(x) with y.
2. Change the subject of the formula to x.
3. Replace x with $f^{-1}(x)$ and y with x.

Higher Maths Key Steps and Exam Strategies

How do you calculate the inverse function of f(x)?

1. Replace f(x) with y.
2. Change the subject of the formula to x.
3. Replace x with $f^{-1}(x)$ and y with x.

Now try it yourself!

A function is given by $f(x) = 7x + 3$.

Find the inverse function $f^{-1}(x)$.

Answer: $f^{-1}(x) = \frac{x-3}{7}$

Higher Maths Key Steps and Exam Strategies

How do you calculate the limit of a recurrence relation?

1

How do you calculate the limit of a recurrence relation?

1 $L = \dfrac{b}{1-a}$

Click here to reveal answer!

Now try it yourself!

A sequence is defined by the recurrence relation

$u_{n+1} = \frac{3}{8}u_n + 10, \quad u_0 = 5$

Calculate the limit where $n \to \infty$.

How do you calculate the limit of a recurrence relation?

1 $L = \dfrac{b}{1-a}$

Now try it yourself!

A sequence is defined by the recurrence relation

$u_{n+1} = \frac{3}{8}u_n + 10, \quad u_0 = 5$

Calculate the limit where $n \to \infty$.

Answer: Limit = 16

Higher Maths Key Steps and Exam Strategies

If given 3 consecutive terms for the recurrence relation $u_{n+1} = au_n + b$, how do you calculate the values of a and b?

1

2

If given 3 consecutive terms for the recurrence relation $u_{n+1} = au_n + b$, how do you calculate the values of a and b?

1. Form 2 equations

2. Solve the equations simultaneously

Now try it yourself!

A sequence is defined by the recurrence relation

$u_{n+1} = au_n + b$, $u_0 = 6$

If $u_1 = 12$ and $u_2 = 15$, find the values of a and b.

Click here to reveal answer!

If given 3 consecutive terms for the recurrence relation $u_{n+1} = au_n + b$, how do you calculate the values of a and b?

1. Form 2 equations

2. Solve the equations simultaneously

Now try it yourself!

A sequence is defined by the recurrence relation

$u_{n+1} = au_n + b$, $u_0 = 6$

If $u_1 = 12$ and $u_2 = 15$, find the values of a and b.

Answer: $a = \frac{1}{2}$, $b = 9$

Higher Maths Key Steps and Exam Strategies

How do you find the rate of change of a function?

1

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Higher Maths Key Steps and Exam Strategies

How do you find the rate of change of a function?

1. $f'(x)$
2. $f'(number)$

Click here to reveal answer!

Now try it yourself!

If $A(r) = 2\pi r^2 + 6\pi r$, what is the rate of change of A with respect to r when $r = 3$?

Higher Maths Key Steps and Exam Strategies

How do you find the rate of change of a function?

1. f′(x)
2. f′(number)

Now try it yourself!

If $A(r) = 2\pi r^2 + 6\pi r$, what is the rate of change of A with respect to r when r = 3?

Answer: $A'(r) = 18\pi$

Higher Maths Key Steps and Exam Strategies

How do you find the gradient of the tangent to a curve when given the x value?

1

2

Higher Maths Key Steps and Exam Strategies

How do you find the gradient of the tangent to a curve when given the x value?

1. f'(x)
2. f'(number)

Now try it yourself!

Find the gradient of the tangent to the curve $y = 2x^3 + 3x^2 - 5x + 1$ at the point where $x = 1$.

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

How do you find the gradient of the tangent to a curve when given the x value?

1. f'(x)
2. f'(number)

Now try it yourself!

Find the gradient of the tangent to the curve $y = 2x^3 + 3x^2 - 5x + 1$ at the point where $x = 1$.

Answer: $m = 7$

Higher Maths Key Steps and Exam Strategies

How do you find the equation of the tangent to a curve when given the x value?

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Higher Maths Key Steps and Exam Strategies

How do you find the equation of the tangent to a curve when given the x value?

1. Sub in to get y
2. f'(x)
3. f'(number)
4. y – b...

Now try it yourself!

Find the equation of the tangent to the curve $y = 3x^3 + x^2 - 6x + 8$ at the point where $x = -1$.

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

How do you find the equation of the tangent to a curve when given the x value?

1. Sub in to get y
2. f'(x)
3. f'(number)
4. y – b...

Now try it yourself!

Find the equation of the tangent to the curve $y = 3x^3 + x^2 - 6x + 8$ at the point where $x = -1$.

Answer: $y = x + 13$

Higher Maths Key Steps and Exam Strategies

How do you find the point of contact when given the gradient of the tangent to a curve?

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Higher Maths Key Steps and Exam Strategies

How do you find the point of contact when given the gradient of the tangent to a curve?

Click here to reveal answer!

Now try it yourself!

A point (x, y) lies on the curve with equation $y = x^2 - 8x$. Calculate the coordinates for which the gradient of the tangent is 6.

1. $f'(x)$
2. Set $f'(x)$ equal to gradient
3. Find x (set equal to zero and factorise)
4. Sub in to get y

Higher Maths Key Steps and Exam Strategies

How do you find the point of contact when given the gradient of the tangent to a curve?

1. $f'(x)$
2. Set $f'(x)$ equal to gradient
3. Find x (set equal to zero and factorise)
4. Sub in to get y

Now try it yourself!

A point (x, y) lies on the curve with equation $y = x^2 - 8x$. Calculate the coordinates for which the gradient of the tangent is 6.

Answer: $(7, -7)$

Higher Maths Key Steps and Exam Strategies

How do you find stationary points and determine their nature?

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Higher Maths Key Steps and Exam Strategies

How do you find stationary points and determine their nature?

1. f'(x)
2. @ SP's...
3. Set equal to zero
4. Find x (Factorise)
5. Find y (Sub in)
6. Nature table

Click here to reveal answer!

Now try it yourself!

Find the coordinates of the stationary points of the curve with equation $y = x^3 + 3x^2 - 9x + 7$ and determine their nature.

Higher Maths Key Steps and Exam Strategies

How do you find stationary points and determine their nature?

1. f'(x)
2. @ SP's...
3. Set equal to zero
4. Find x (Factorise)
5. Find y (Sub in)
6. Nature table

Now try it yourself!

Find the coordinates of the stationary points of the curve with equation $y = x^3 + 3x^2 - 9x + 7$ and determine their nature.

Answer: Max TP @ (-3, 34) and Min TP @ (1, 2)

Higher Maths Key Steps and Exam Strategies

How do you sketch a curve?

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Higher Maths Key Steps and Exam Strategies

How do you sketch a curve?

Click here to reveal answer!

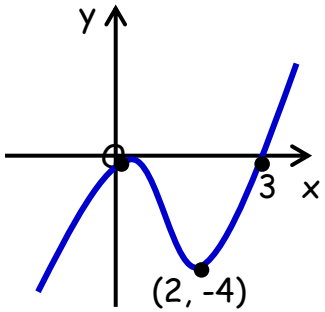
Now try it yourself!

Sketch the graph of $y = x^3 - 3x^2$ showing clearly where it meets the x and y axes.

1. calculate the y-intercept (sub in x = 0)
2. find the roots (set = 0 and factorise)
3. Calculate any stationary points and determine their nature
4. Show all information in a sketch

Higher Maths Key Steps and Exam Strategies

How do you sketch a curve?



Now try it yourself!

Sketch the graph of $y = x^3 - 3x^2$ showing clearly where it meets the x and y axes.

1. calculate the y-intercept (sub in x = 0)
2. find the roots (set = 0 and factorise)
3. Calculate any stationary points and determine their nature
4. Show all information in a sketch

Higher Maths Key Steps and Exam Strategies

How do you solve a quadratic inequality?

1

2

Higher Maths Key Steps and Exam Strategies

How do you solve a quadratic inequality?

Click here to reveal answer!

1. Find the roots

   (set equal to zero and factorise)

2. Sketch the graph

Now try it yourself!

Solve $x^2 - x - 6 < 0$

Higher Maths Key Steps and Exam Strategies

How do you solve a quadratic inequality?

1. Find the roots

   (set equal to zero and factorise)

2. Sketch the graph

Now try it yourself!

Solve $x^2 - x - 6 < 0$

Answer: $-2 < x < 3$

Higher Maths Key Steps and Exam Strategies

For a quadratic of the form $y = k(x + a)(x + b)$, how do you find the values of k, a and b when given the roots and another point on the curve?

1

2

Higher Maths Key Steps and Exam Strategies

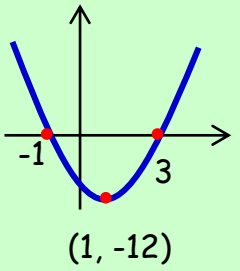
For a quadratic of the form $y = k(x + a)(x + b)$, how do you find the values of k, a and b when given the roots and another point on the curve?

1. Fill in the roots

2. Sub the other point in

Now try it yourself!

The equation of the parabola shown is of the form $y = k(x + a)(x + b)$.



What is the equation of this quadratic?

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

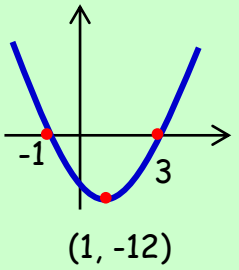
For a quadratic of the form $y = k(x + a)(x + b)$, how do you find the values of k, a and b when given the roots and another point on the curve?

1. Fill in the roots

2. Sub the other point in

Now try it yourself!

The equation of the parabola shown is of the form $y = k(x + a)(x + b)$.



What is the equation of this quadratic?

Answer: $y = 3(x + 1)(x - 3)$

Higher Maths Key Steps and Exam Strategies

How do you write a quadratic in the form $y = a(x + b)^2 + c$?

1

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Higher Maths Key Steps and Exam Strategies

How do you write a quadratic in the form $y = a(x + b)^2 + c$?

Click here to reveal answer!

1. Take out a common factor first

2. Then complete the square as normal

   (don't forget to multiply by the common factor!)

Now try it yourself!

Write
$2x^2 + 16x + 5$
in the form
$a(x + b)^2 + c$

Higher Maths Key Steps and Exam Strategies

How do you write a quadratic in the form $y = a(x + b)^2 + c$?

1. Take out a common factor first

2. Then complete the square as normal

   (don't forget to multiply by the common factor!)

Now try it yourself!

Write
$2x^2 + 16x + 5$
in the form
$a(x + b)^2 + c$

Answer: $2(x + 4)^2 - 27$

Higher Maths Key Steps and Exam Strategies

How do you find the points of intersection between a curve and a straight line?

1

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Higher Maths Key Steps and Exam Strategies

How do you find the points of intersection between a curve and a straight line?

1. Set them equal
2. Set equal to zero
3. Factorise

Now try it yourself!

Find the coordinates of the points of intersection of the curve $y = x^2 - 2x - 17$ and the line $y = 3x + 7$.

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

How do you find the points of intersection between a curve and a straight line?

1. Set them equal
2. Set equal to zero
3. Factorise

Now try it yourself!

Find the coordinates of the points of intersection of the curve $y = x^2 - 2x - 17$ and the line $y = 3x + 7$.

Answer: (-3, -2) and (8, 31)

Higher Maths Key Steps and Exam Strategies

How do you solve a differential equation?

1

2

Higher Maths Key Steps and Exam Strategies

How do you solve a differential equation?

Click here to reveal answer!

1. Integrate
2. Sub the point in

Now try it yourself!

A curve for which $\frac{dy}{dx} = 3x^2 + 1$ passes through the point (-1, 4).

Express y in terms of x.

Higher Maths Key Steps and Exam Strategies

How do you solve a differential equation?

1. Integrate
2. Sub the point in

Now try it yourself!

A curve for which $\frac{dy}{dx} = 3x^2 + 1$ passes through the point (-1, 4).

Express y in terms of x.

Answer: $y = x^3 + x + 6$

Higher Maths Key Steps and Exam Strategies

How do you evaluate a definite integral?

1

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Higher Maths Key Steps and Exam Strategies

How do you evaluate a definite integral?

1. Integrate
2. Sub in upper limit
3. Sub in lower limit
4. Take them away

Click here to reveal answer!

Now try it yourself!

Evaluate

$$\int_1^3 4x\,dx.$$

Higher Maths Key Steps and Exam Strategies

How do you evaluate a definite integral?

1. Integrate
2. Sub in upper limit
3. Sub in lower limit
4. Take them away

Now try it yourself!

Evaluate

$$\int_1^3 4x\,dx.$$

Answer: 16

Higher Maths Key Steps and Exam Strategies

How do you calculate the area between 2 curves when you are not given the limits of integration?

1

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Higher Maths Key Steps and Exam Strategies

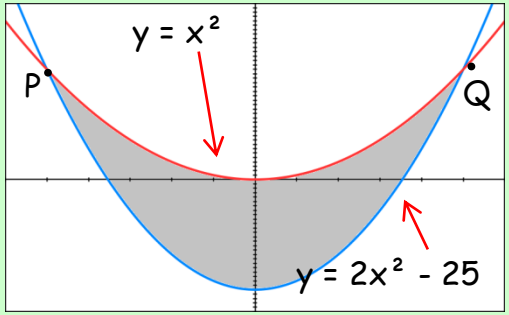
How do you calculate the area between 2 curves when you are not given the limits of integration?

Click here to reveal answer!

1. Set them equal
2. Set = 0
3. Factorise
4. $Area = \int_a^b top - bottom \, dx$

Now try it yourself!

The curve $y = 2x^2 - 25$ intersects the curve $y = x^2$ at points P and Q.



Calculate the shaded area.

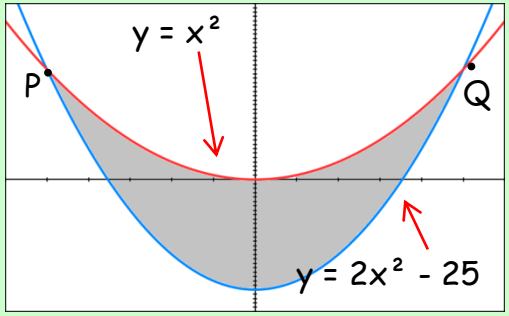
Higher Maths Key Steps and Exam Strategies

How do you calculate the area between 2 curves when you are not given the limits of integration?

1. Set them equal
2. Set = 0
3. Factorise
4. $$Area = \int_a^b top - bottom \, dx$$

Now try it yourself!

The curve $y = 2x^2 - 25$ intersects the curve $y = x^2$ at points P and Q.



Calculate the shaded area.

Answer: $\frac{500}{3}\ units^2$

Higher Maths Key Steps and Exam Strategies

How do you find the centre and radius of a circle in the form $(x + a)^2 + (y + b)^2 = r^2$?

1

2

Higher Maths Key Steps and Exam Strategies

How do you find the centre and radius of a circle in the form $(x + a)^2 + (y + b)^2 = r^2$?

1. For centre, change the signs

2. For radius, square root this number

Click here to reveal answer!

Now try it yourself!

Find the centre and radius of the following circle;

$$(x - 7)^2 + (y + 2)^2 = 64$$

Higher Maths Key Steps and Exam Strategies

How do you find the centre and radius of a circle in the form $(x + a)^2 + (y + b)^2 = r^2$?

1. For centre, change the signs

2. For radius, square root this number

Now try it yourself!

Find the centre and radius of the following circle;

$$(x - 7)^2 + (y + 2)^2 = 64$$

Answer: C(7, -2), r = 8

Higher Maths Key Steps and Exam Strategies

How do you find the centre and radius of a circle in the form $x^2 + y^2 + 2gx + 2fy + c = 0$?

1

2

Higher Maths Key Steps and Exam Strategies

How do you find the centre and radius of a circle in the form $x^2 + y^2 + 2gx + 2fy + c = 0$?

1. For centre, half them and change the signs

2. For radius, $r = \sqrt{g^2 + f^2 - c}$

Click here to reveal answer!

Now try it yourself!

Find the centre and radius of the following circle;

$x^2 + y^2 + 2x - 18y + 46 = 0$

Higher Maths Key Steps and Exam Strategies

How do you find the centre and radius of a circle in the form $x^2 + y^2 + 2gx + 2fy + c = 0$?

1. For centre, half them and change the signs

2. For radius, $r = \sqrt{g^2 + f^2 - c}$

Now try it yourself!

Find the centre and radius of the following circle;

$x^2 + y^2 + 2x - 18y + 46 = 0$

Answer: C(-1, 9), r = 6

Higher Maths Key Steps and Exam Strategies

How do you calculate the equation of the tangent to a circle when given the equation of the circle and the point of contact?

1

2

3

4

Higher Maths Key Steps and Exam Strategies

How do you calculate the equation of the tangent to a circle when given the equation of the circle and the point of contact?

1. Get the centre
2. m_{radius}
3. m_{perp}
4. y - b...

Now try it yourself!

Find the equation of the tangent at the point (3, -2) on the circle

$$x^2 + y^2 - 10x + 8y - 10 = 0$$

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

How do you calculate the equation of the tangent to a circle when given the equation of the circle and the point of contact?

1. Get the centre
2. m_{radius}
3. m_{perp}
4. y – b…

Now try it yourself!

Find the equation of the tangent at the point (3, -2) on the circle

$$x^2 + y^2 - 10x + 8y - 10 = 0$$

Answer: y = x - 5

Higher Maths Key Steps and Exam Strategies

How do you show that a line is a tangent to a circle/intersects a circle/does not intersect a circle?

1

2

3

4

5

Higher Maths Key Steps and Exam Strategies

How do you show that a line is a tangent to a circle/intersects a circle/does not intersect a circle?

DO NOT SET THEM EQUAL

1. Sub it in wherever there's a y (or an x!)
2. Multiply brackets and gather like terms
3. Factorise/discriminant
4. Make a statement

(since only 1 point of contact/since $b^2 - 4ac$ is…)

5. Sub in to get y where appropriate

Click here to reveal answer!

Now try it yourself!

Show that the line $y = x - 2$ is a tangent to the circle $x^2 + y^2 + x - 9y - 4 = 0$ and find the coordinates of the point of contact.

Higher Maths Key Steps and Exam Strategies

How do you show that a line is a tangent to a circle/intersects a circle/does not intersect a circle?

DO NOT SET THEM EQUAL

1. Sub it in wherever there's a y (or an x!)
2. Multiply brackets and gather like terms
3. Factorise/discriminant
4. Make a statement

(since only 1 point of contact/since $b^2 - 4ac$ is…)

5. Sub in to get y where appropriate

Answer: (3, 1)

Now try it yourself!

Show that the line $y = x - 2$ is a tangent to the circle $x^2 + y^2 + x - 9y - 4 = 0$ and find the coordinates of the point of contact.

Higher Maths Key Steps and Exam Strategies

If sina is an acute angle how to you find the exact value of sin2a?

1

2

3

Higher Maths Key Steps and Exam Strategies

If sina is an acute angle how to you find the exact value of sin2a?

1. Formula sheet
2. Draw a triangle and calculate missing side
3. Sub into formula

Now try it yourself!

If A is an acute angle with $\sin A = \frac{3}{4}$ find the exact value of sin2A.

Click here to reveal answer!

If sina is an acute angle how to you find the exact value of sin2a?

1. Formula sheet
2. Draw a triangle and calculate missing side
3. Sub into formula

Now try it yourself!

If A is an acute angle with $\sin A = \frac{3}{4}$ find the exact value of $\sin 2A$.

Answer: $\frac{3\sqrt{7}}{8}$

Higher Maths Key Steps and Exam Strategies

If cosa is an acute angle how to you find the exact value of cos2a?

1

2

Higher Maths Key Steps and Exam Strategies

If cosa is an acute angle how to you find the exact value of cos2a?

1. Formula sheet (use middle one!)

2. Square it, double it, take away 1

Now try it yourself!

If A is an acute angle with $\cos A = \frac{3}{7}$ find the exact value of cos2A.

Click here to reveal answer!

If cosa is an acute angle how to you find the exact value of cos2a?

1. Formula sheet (use middle one!)

2. Square it, double it, take away 1

Now try it yourself!

If A is an acute angle with $\cos A = \frac{3}{7}$ find the exact value of $\cos 2A$.

Answer: $-\frac{31}{49}$

Higher Maths Key Steps and Exam Strategies

How do you solve a "type 1" trig equation, i.e. only 1 trig term?

1

Higher Maths Key Steps and Exam Strategies

How do you solve a "type 1" trig equation, i.e. only 1 trig term?

1 Take stuff across

Click here to reveal answer!

Now try it yourself!

Solve
$4\sin(3x - 30)° - 2 = 0$
for $0 \leq x \leq 270°$.

How do you solve a "type 1" trig equation, i.e. only 1 trig term?

1 Take stuff across

Now try it yourself!

Solve
$4\sin(3x - 30)° - 2 = 0$
for $0 \leq x \leq 270°$.

Answer: $x = 20°, 70°, 140°, 190°, 260°$

Higher Maths Key Steps and Exam Strategies

How do you solve a "type 2" trig equation, i.e. more than 1 trig term and sin2x?

1

2

3

4

Higher Maths Key Steps and Exam Strategies

How do you solve a "type 2" trig equation, i.e. more than 1 trig term and sin2x?

1. Make sure it's equal to zero
2. Formula sheet
3. Factorise
4. Solve 2 equations

Now try it yourself!

Solve $\sin 2x = \cos x$ for $0 \leq x \leq 2\pi$.

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

How do you solve a "type 2" trig equation, i.e. more than 1 trig term and sin2x?

1. Make sure it's equal to zero
2. Formula sheet
3. Factorise
4. Solve 2 equations

Now try it yourself!

Solve $\sin 2x = \cos x$ for $0 \leq x \leq 2\pi$.

Answer: $x = \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{3\pi}{2}$

Higher Maths Key Steps and Exam Strategies

How do you solve a "type 3" trig equation, i.e. more than 1 trig term and cos2x?

1

2

3

4

Higher Maths Key Steps and Exam Strategies

How do you solve a "type 3" trig equation, i.e. more than 1 trig term and cos2x?

1. Make sure it's equal to zero
2. Formula sheet
3. Factorise
4. Solve 2 equations

Now try it yourself!

Solve the equation $2\cos 2x = 3\cos x - 1$ for $0 \leq x \leq 2\pi$.

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

How do you solve a "type 3" trig equation, i.e. more than 1 trig term and cos2x?

1. Make sure it's equal to zero
2. Formula sheet
3. Factorise
4. Solve 2 equations

Now try it yourself!

Solve the equation $2\cos 2x = 3\cos x - 1$ for $0 \leq x \leq 2\pi$.

Answer: $x = 0, 1{\cdot}82, 4{\cdot}46, 2\pi$

Higher Maths Key Steps and Exam Strategies

How do you show that the 3D points A, B and C are collinear?

1

2

3

Higher Maths Key Steps and Exam Strategies

How do you show that the 3D points A, B and C are collinear?

1. Find $\overrightarrow{AB}$
2. Find $\overrightarrow{BC}$
3. Write statement with ratio

Now try it yourself!

Show that A(-1, 0, 1), B(2, 6, 7) and C(6, 14, 15) are collinear and find the ratio in which B divides AC.

Click here to reveal answer!

Higher Maths Key Steps and Exam Strategies

How do you show that the 3D points A, B and C are collinear?

1. Find $\overrightarrow{AB}$
2. Find $\overrightarrow{BC}$
3. Write statement with ratio

Now try it yourself!

Show that A(-1, 0, 1), B(2, 6, 7) and C(6, 14, 15) are collinear and find the ratio in which B divides AC.

Answer: Since $\overrightarrow{AB} : \overrightarrow{BC} = 3 : 4$ and B is a common point, points are collinear.