

Year 10 Term 2 Homework

Student Name: _____	Grade: _____
Date: _____	Score: _____

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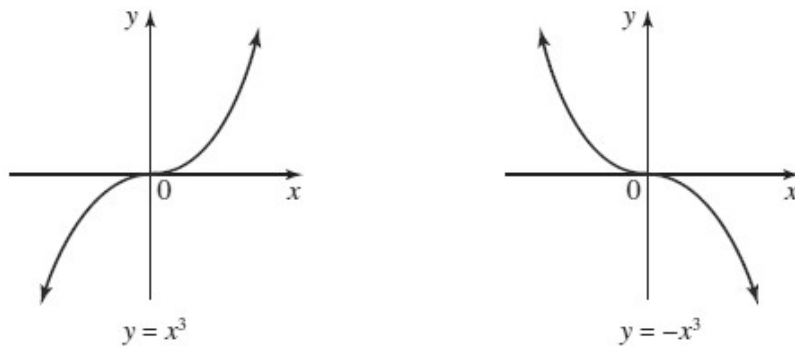
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5 Year 10 Term 2 Week 5 Homework

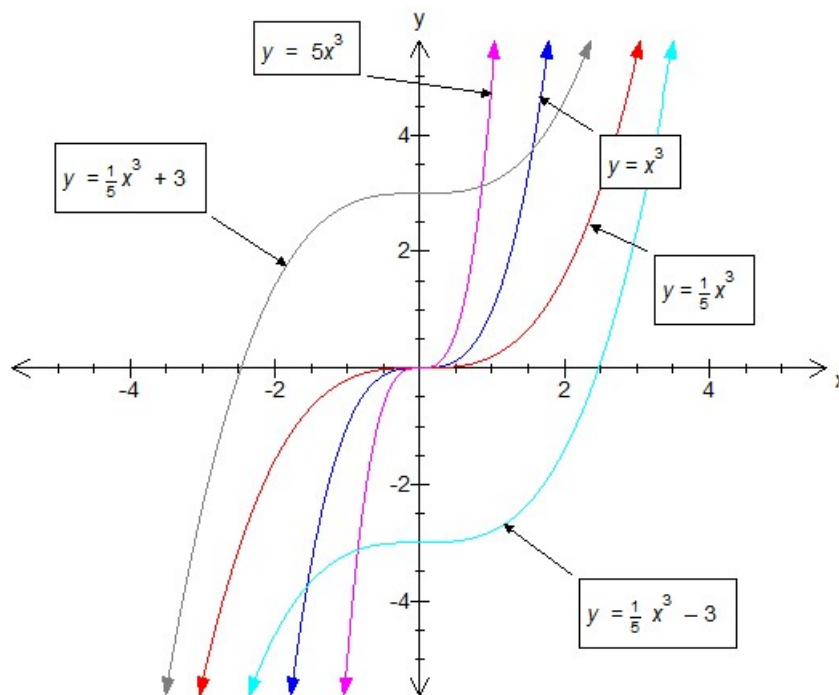
5.1 Graphs in the number plane

5.1.1 The cubic curve $y = ax^3 + d$

- The curve is a smooth, continuous curve.
- The curve increases from left to right.
- The point of inflexion has co-ordinates (0, 0).
- The curve has point symmetry about the origin.
- The graph of $y = -x^3$ is a reflection in the x-axis of the graph of $y = x^3$

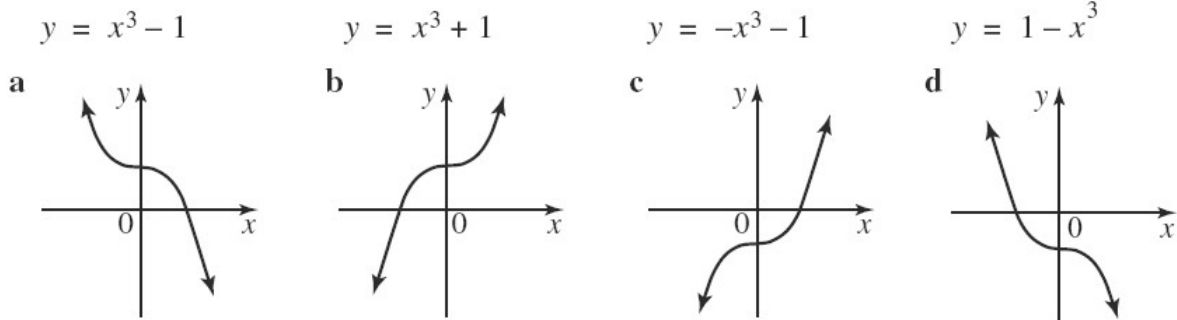


- The curve becomes steeper as the value of **a** increases.
- Adding a constant to the cubic equation $y = ax^3$ is to move the cubic curve up or down.



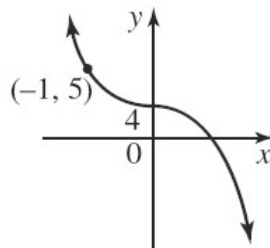
Exercise 5.1.1

1. Match each equation with one of the graphs below:



2. The cubic curve $y = x^3$ is reflected in the x -axis then translated 4 units up. What is the equation of the new curve?

3. The curve shown below is cubic with equation of the form $y = ax^3 + d$. Find the values for a and d , hence determine its equation.

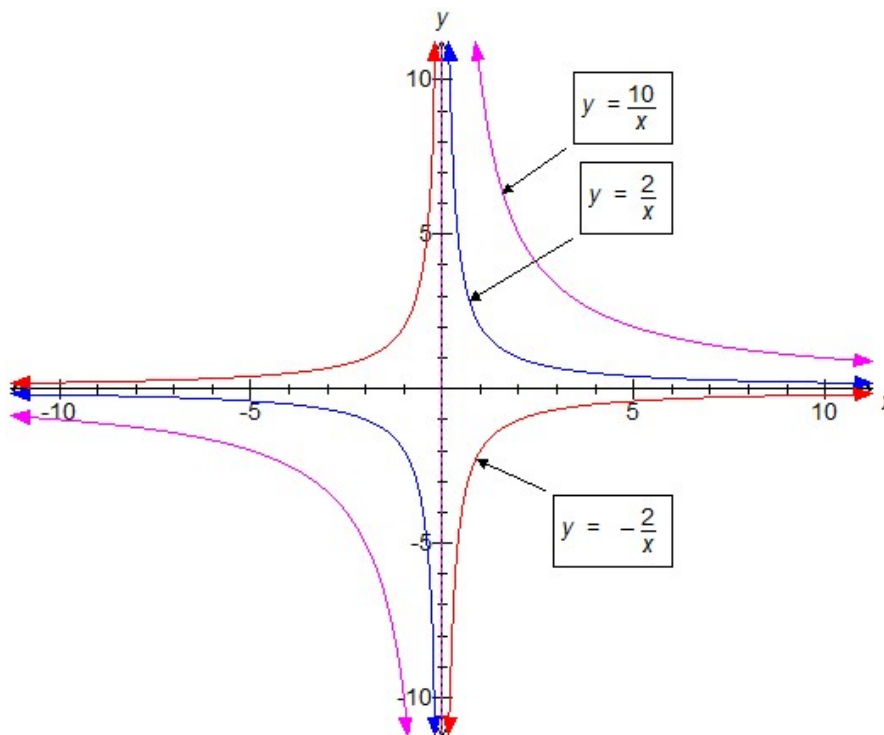


4. Write down the co-ordinates of the point of inflexion for each curve:

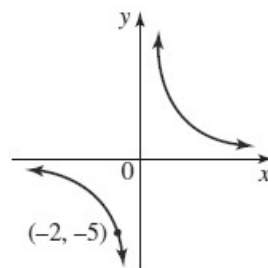
- (a) $y = 3x^3$ _____
- (b) $y = x^3 + 3$ _____
- (c) $y = -3x^3 - 3$ _____

5.1.2 The hyperbola $y = \frac{k}{x}$

- The graph is a smooth, discontinuous curve consisting of two separate branches.
- The curve has point symmetry about the origin.
- The lines $y = x$ and $y = -x$ are axes of symmetry.
- The curve lies in the first and third quadrants if $k > 0$, and in the second and fourth quadrants if $k < 0$.
- The x and y axes are asymptotes.



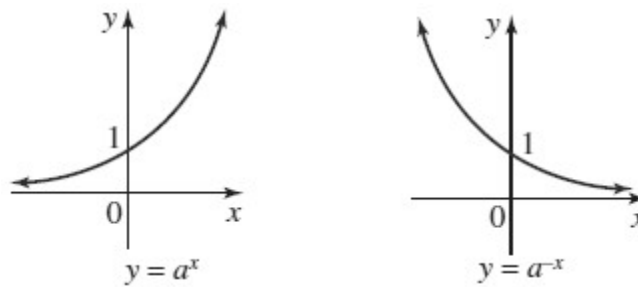
Example 5.1.1 The curve shown is a hyperbola. It has an equation of the form $xy = k$. Find the value of k and hence write down the equation of the hyperbola.



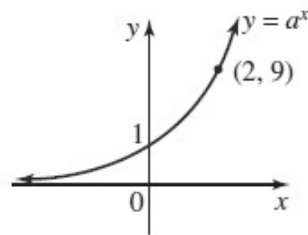
Solution: To find the value of k , substitute the co-ordinate of the given point into the equation of the curve we have: $xy = k$, $(-2) \times (-5) = 10$
 \therefore The equation of the hyperbola is $xy = 10$.

5.1.3 The exponential curve $y = a^x$

- The graph is a smooth and continuous curve.
- The curve increase from left to right for $y = a^x$, where $a > 0$.
- The curve decrease from left to right for $y = a^{-x}$, where $a > 0$.
- The curve lies entirely about the x-axis.
- the x-axis is a horizontal asymptote.

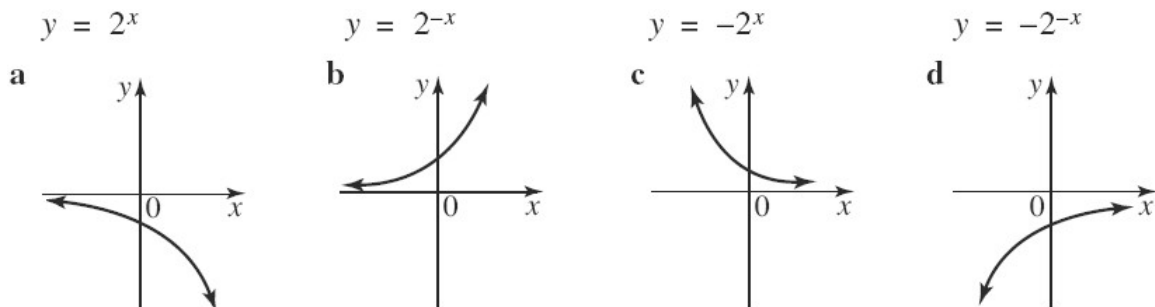


Example 5.1.2 The curve shown is an exponential curve. It has an equation of form $y = a^x (a > 0)$. Find the value of a and hence write down the equation of the curve.



Solution: To find the value of a substitute the co-ordinates of the given point into the equation of the curve we have $y = a^x$ $9 = a^2$
 \therefore the equation of the curve is $y = 3^x$.

Exercise 5.1.2 Match each equation with one of the graphs below:



5.1.4 The circle $x^2 + y^2 = r^2$

- The equation of a circle with center(0, 0) and radius r units is: $x^2 + y^2 = r^2$
- If a point satisfies the inequality $x^2 + y^2 < r^2$, then the point lies inside the circle.
- If a point satisfies the inequality $x^2 + y^2 > r^2$, then the point lies outside the circle.
- The equation of an upper semi-circle is: $y = \sqrt{r^2 - x^2}$
- The equation of a lower semi-circle is: $y = -\sqrt{r^2 - x^2}$

Exercise 5.1.3

1. Find, in the form $ax^2 + ay^2 = b^2$ where a, b are integers, the equation of a circle with centre (0, 0) and radius:

(a) $2\frac{1}{2}$

(b) $3\frac{3}{4}$

2. Find the equation of the circle centre (0, 0) which passes through each of these points:

(a) (3, -4)

(b) $(-2\sqrt{3}, \sqrt{5})$

3. Shade the region where both inequalities hold simultaneously.

(a) $x^2 + y^2 \geq 4$ and $x > 1$ _____

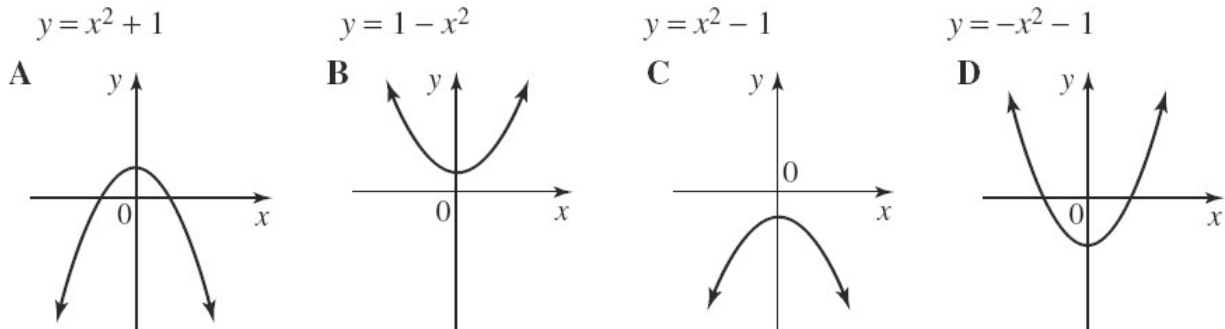
(b) $x^2 + y^2 > 16$ and $y \leq 0$ _____

(c) $9 < x^2 + y^2 \leq 25$ _____

5.1.5 Miscellaneous exercises

Exercise 5.1.4

1. Match each equation with one of the graphs below:



2. State whether each equation is the equation of a straight line (L) a parabola (P), a cubic (CU), a hyperbola (H), an exponential curve (E) or a circle (C).

(a) $xy = -2$ _____

(b) $y = -\frac{x}{2}$ _____

(c) $y = -2^x$ _____

(d) $x^2 + y^2 = 2$ _____

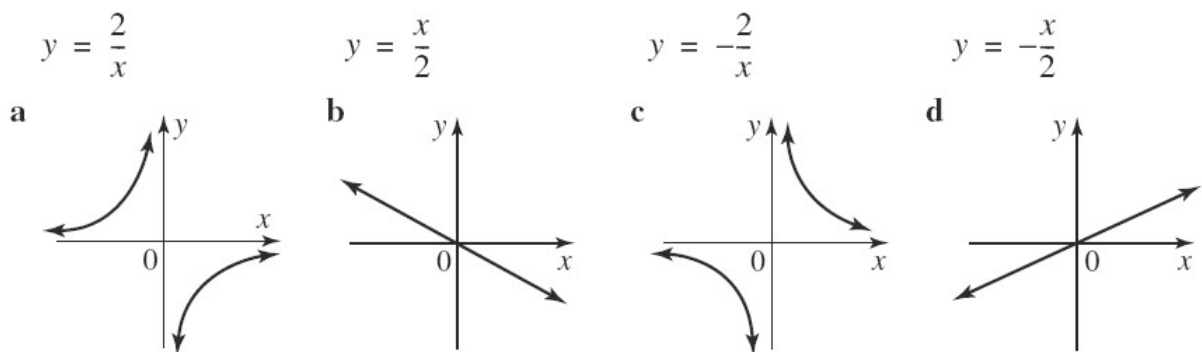
(e) $y = x^3$ _____

(f) $y = x^2 - 2x + 4$ _____

(g) $2x^2 + 2y^2 = 4$ _____

(h) $x = 2y$ _____

3. Match each equation with one of the graphs below:



Exercise 5.1.5 A farmer wishes to construct a rectangular enclosure for his ducks. He has 40 m of fencing and is using a existing wall as one side of the enclosure.

1. If the width of the enclosure is x metres, find an expression for the length.

2. Find an expression for the area of the rectangular docks.

3. What dimension (length and breadth) will give the maximum area?

4. What is the maximum area of the rectangle?

5.2 Maths Challenge

Exercise 5.2.1

1. A sheet of cardboard measuring 30 cm by 20 cm has squares cut off its corners so that it can be folded into an open box. Find the dimensions of the box if the base area is 400 cm^2 . (correct your answers to 2 decimal places.)

2. A store buys an item for a certain price, sells it at \$12.58 and incurs a profit percentage that is the same number as the buying price. Find the purchase price of the item.

3. Ken's money was invested for one year to earn 12% per annum on half of it, 9% per annum on one third of it and 6% per annum on the remainder. What is Ken's overall interest rate?
