

## QUADRATIC & EXPONENTIAL FUNCTIONS

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### Lesson Description

In this lesson we:

- Examine parabolas and exponential graphs
- Find the equation of graphs
- Discuss graph interpretation



### Summary

#### Quadratic functions

$$y = ax^2 + q$$

- for  $a > 0$ , the parabola  $y = ax^2 + q$  has a minimum point at  $(0; q)$
- for  $a < 0$ , the parabola  $y = ax^2 + q$  has a maximum turning point at  $(0; q)$
- $y = ax^2 + q$  is a vertical shift of the parabola  $y = ax^2$  by  $q$  units (graph slides up if  $q > 0$  and down if  $q < 0$ )

#### Exponential function

$$y = a \cdot k^x + q$$

- Horizontal asymptote at  $y = q$
- The  $y$  intercept is  $(0; a + q)$
- The graph of  $y = a \cdot k^x + q$  is a vertical shift either up (for  $q > 0$ ) or down (for  $q < 0$ ) of  $y = a \cdot k^x$  by  $q$  units.
- For  $a > 0$  the graph curves upward and for  $a < 0$  the graph curves downward



### Test Yourself

#### Question 1

Rewrite  $y = (\frac{1}{2})^x$

- $y = 2^x$
- $y = \frac{1}{2}$
- $y = 2^x + 1$
- $y = 2^{-x}$

#### Question 2

For  $a < 0$  the range of  $y = ax^2 + q$  is:

- $y \in (-\infty; q)$
- $x \in (-\infty; q)$
- $y \in \mathbb{R}$
- $x \leq q$

#### Question 3

For  $y = k^x$  and  $k > 1$ , the greater the value  $k$ , the steeper the curve. True or false?

**Question 4**

The coordinates of the turning point of the graph  $f(x) = -2x^2+8$  is:

- A. 8
- B. (-2;8)
- C. -2
- D. (0;8)

**Question 5**

The domain of  $g(x) = (\frac{1}{4})^x+2$  is:

- A.  $x \in \mathbb{R}$
- B.  $y \in \mathbb{R}$
- C.  $x \in \mathbb{R}; x \neq 0$
- D.  $y \in \mathbb{R}; y \neq 0$



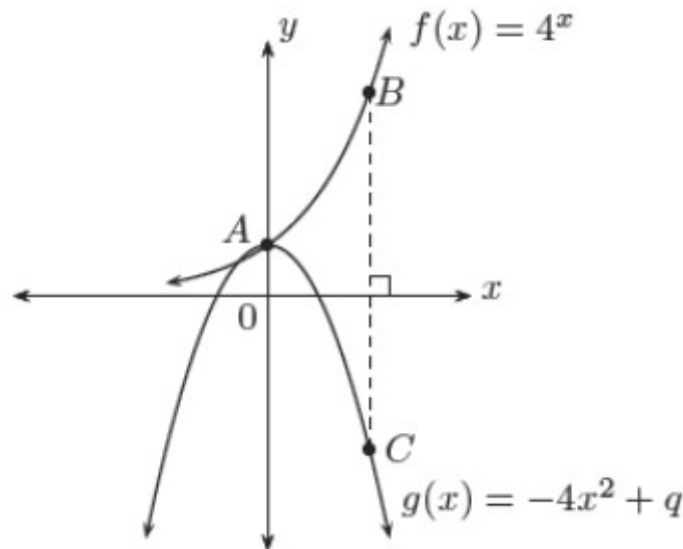
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**Question 1**

Sketch the graph  $f(x) = 3 \cdot 2^x + 2$

**Question 2**

The graphs of  $f(x) = 4^x$  and  $g(x) = -4x^2+q$  are sketched below. The points A(0;1), B(1;4) and C are given.



- a.) Determine the value of  $q$
- b.) Calculate the length of BC
- c.) Give the equation of  $f(x)$  reflected about the  $x$  axis
- d.) Give the equation of  $f(x)$  shifted vertically upward by 1 unit, call that  $h(x)$
- e.) What is the equation of the asymptote of  $h(x)$ ?
- f.) Find the range of  $g(x)$