

# MCR3U Chapter 1 Test

Name: Answers

Show ALL work.

K	/ 21
T	/ 9
C	/ 8
A	/ 12

Total / 50

1. Graph each of the following functions. Graphs should include all points that appear in the domain and range of the grid provided, with a smooth line passing through the points.

a)  $y = (x+7)^2 - 4$

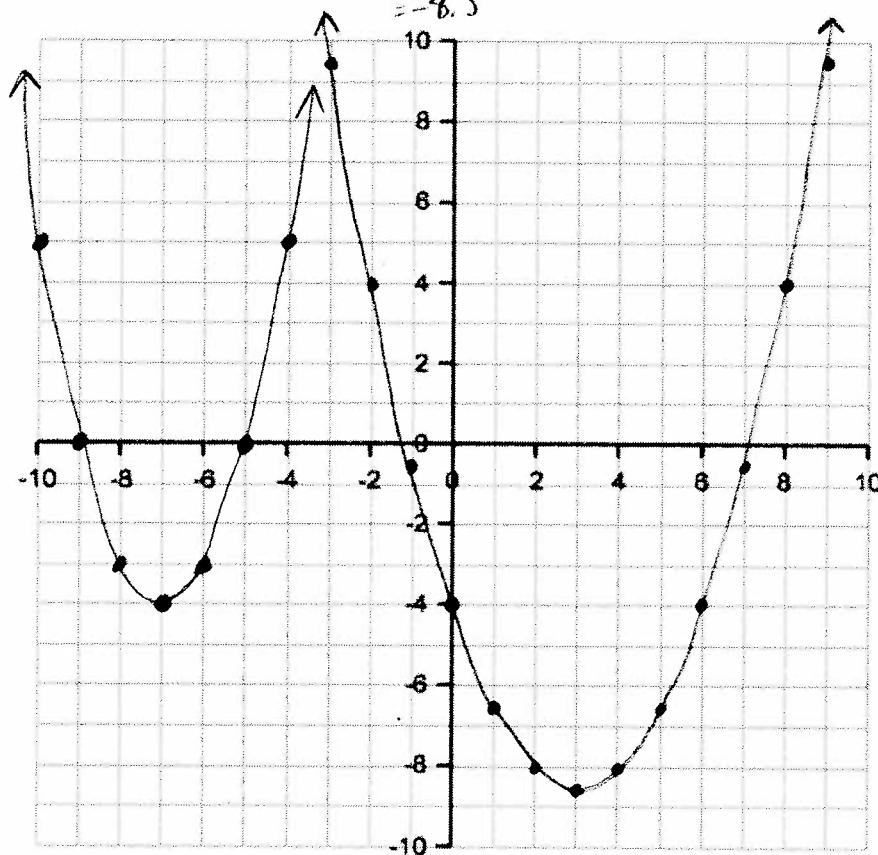
Vertex:  $(-7, -4)$

Steps: 1, 3, 5, 7

b)  $f(x) = \frac{1}{2}x^2 - 3x - 4$

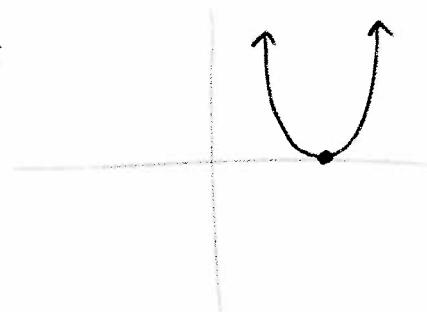
$x = \frac{-b}{2a} = \frac{3}{2(\frac{1}{2})} = 3$

$f(3) = \frac{1}{2}(3)^2 - 3(3) - 4$  Vertex  $(3, -8.5)$   
 $= 4.5 - 9 - 4$   
 $= -8.5$



2. If a certain quadratic function has only one x-intercept, what does this tell us about its vertex? Sketch an example to justify your answer.

Vertex must be on x-axis



3. Solve each of the following quadratic equations.

a)  $3x^2 - 11x + 6 = 0$

$$3x^2 - 9x - 2x + 6 = 0$$

$$3x(x-3) - 2(x-3) = 0$$

$$(3x-2)(x-3) = 0$$

$\overline{6C}$   $x = \frac{2}{3}, 3$

b)  $12x^2 - 27 = 0$

$$3(4x^2 - 9) = 0$$

$$3(2x-3)(2x+3) = 0$$

$$x = \pm \frac{3}{2}$$

4. Determine an equation in factored form for the quadratic function that contains the point (0, 8) and has x-intercepts at 4 and -3. Use fractions, not decimals, if necessary.

$$y = a(x-4)(x+3)$$

$$8 = a(0-4)(0+3)$$

$$8 = a(-4)(3)$$

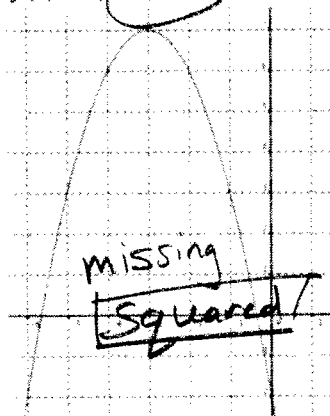
$$\frac{8}{-12} = \frac{-12a}{-12}$$

$$a = -\frac{2}{3}$$

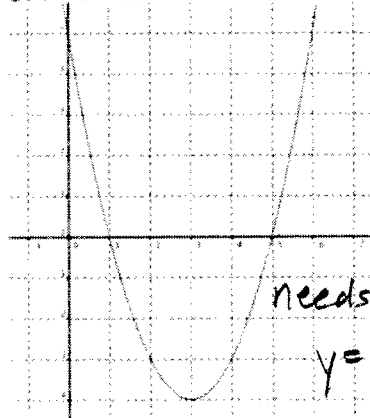
$$\text{So } y = -\frac{2}{3}(x-4)(x+3)$$

5. A student wrote the following equations for the graphs provided below. State the error in each of the equations (why do they NOT correctly represent the graphs?).

$$f(x) = -(x+3) + 7$$



$$g(x) = (x+1)(x+5)$$



6. Determine the point(s) of intersection of the functions  $f(x) = 2(x-6)^2 - 1$  and  $g(x) = 8x - 57$ .
- $$= 2(x^2 - 12x + 36) - 1$$
- $$= 2x^2 - 24x + 71$$

$$2x^2 - 24x + 71 = 8x - 57$$

$$2x^2 - 24x - 8x + 71 + 57 = 0$$

$$2x^2 - 32x + 128 = 0$$

$$2(x^2 - 16x + 64) = 0$$

$$2(x-8)(x-8) = 0$$

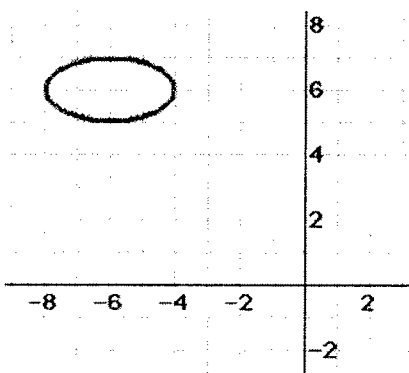
6A

$$x = 8 \text{ only.}$$

$$\begin{aligned} \text{So } y &= 8(8) - 57 \\ &= 64 - 57 \\ &= 7 \end{aligned}$$

$\therefore$  They intersect at  $(8, 7)$

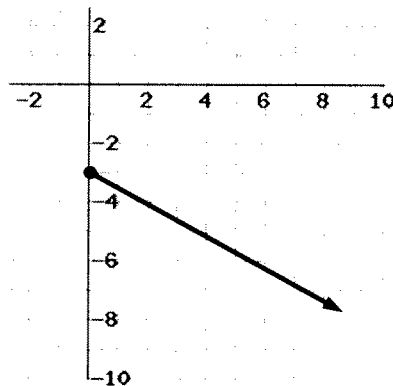
7. Find the domain and range of each of the following curves:



6K

$$\text{Domain: } -8 \leq x \leq -2$$

$$\text{Range: } 3 \leq y \leq 7$$



$$\text{Domain: } x \geq 0$$

$$\text{Range: } y \leq -3$$

$$p(x) = -3(x-2)^2 - 23$$

$$\text{Domain: } x \in \mathbb{R}$$

$$\text{Range: } y \leq -23$$

8. Given that
- $$f(x) = 9x^2 - 6$$
- $$g(x) = -2x + 7$$
- $$h(x) = (x+2)(x-3)$$

Calculate the value of:

a)  $g(1)$

$$= -2(1) + 7$$

$$= 5$$

$\overline{2K}$

b)  $f(-\frac{1}{3}) = 9(-\frac{1}{3})^2 - 6$

$$= 9(\frac{1}{9}) - 6$$

$$= 1 - 6$$

$$= -5$$

c)  $h(-2)$

$$= (-2+2)(-2-3)$$

$$= (0)(-5)$$

$$= 0$$

$\overline{2K}$

d)  $g(k)$  [Your answer will have  $k$  in it]

$$= -2(k) + 7$$

$$= -2k + 7$$

9. Factor each of the following expressions.

a)  $y = 4x^2 - 64$

$$= 4(x^2 - 16)$$

$$= 4(x-4)(x+4)$$

$\overline{2A}$

b)  $q(x) = 10x^2 - 7x - 3$

$$= 10x^2 - 10x + 3x - 3$$

$$= 10x(x-1) + 3(x-1)$$

$$= (10x+3)(x-1)$$

10. Solve for  $x$  where  $x(\frac{1}{2}x+1)-12=-(x-4)(x+3)$

$$\frac{1}{2}x^2 + x - 12 = -(x^2 - x - 12)$$

$$\frac{1}{2}x^2 + x - 12 + (x^2 - x - 12) = 0 \checkmark$$

$$1.5x^2 - 24 = 0$$

$$1.5(x^2 - 16) = 0$$

$$1.5(x-4)(x+4) = 0$$

$$x = 4, -4 \checkmark$$

4A

11. Find the equation of this parabola.

$$y = ax(x-6)$$

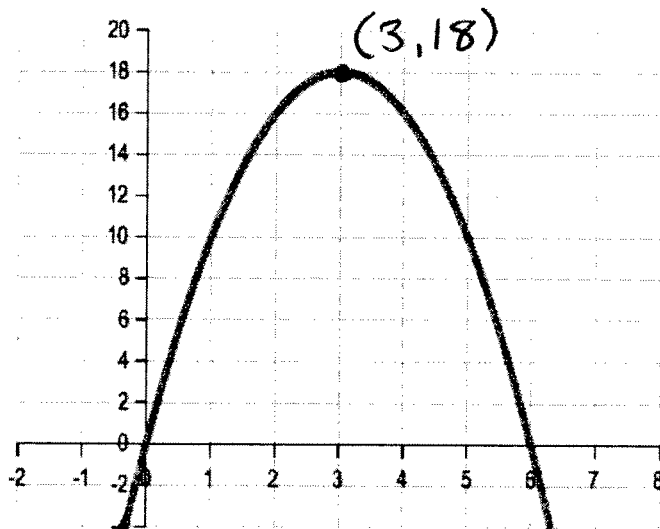
$$18 = a(3)(3-6)$$

$$18 = a(3)(-3)$$

$$\frac{18}{-9} = \frac{-9a}{-9}$$

$$a = -2$$

$$\therefore y = -2x(x-6)$$



4K

12. Consider two parabolas:

- One has equation  $y = \frac{1}{2}(x-4)(x+4)$  and has its vertex at  $(0, -8)$
- The other has the same x-intercepts, but goes through the point  $(2, -12)$

How far apart are the vertices (vertexes) of the two parabolas?

↓

$$\checkmark y = a(x-4)(x+4)$$

$$-12 = a(2-4)(2+4)$$

$$-12 = a(-2)(6)$$

$$-12 = -12a$$

$$\checkmark a = 1$$

$$\therefore y = (x-4)(x+4)$$

$$\checkmark = x^2 - 16$$

$$\checkmark \therefore \text{Vertex at } (0, -16)$$

$\therefore$  The distance between the two vertices is 8 ✓  
(from  $(0, -16)$  to  $(0, -8)$ )