

W4 - Quadratics in Factored Form

MPM2D

Jensen

Unit 4

1) Given the following quadratic equations, determine the **i) x-intercepts** using the zero product rule, **ii) the axis of symmetry**, **iii) the vertex** **iv) graph the quadratic**

a)  $y = (x + 3)(x - 1)$

i)  $x + 3 = 0$      $x - 1 = 0$     ii) a.o.s:  $x = \frac{-3+1}{2}$   
 $x = -3$      $x = 1$      $x = -1$   
 $(-3, 0)$      $(1, 0)$

iii)  $x$ -vertex =  $-1$   
 $y$ -vertex =  $(-1+3)(-1-1)$   
 $= -4$   
 $(-1, -4)$

b)  $y = 2(x + 4)(x - 2)$

i)  $x + 4 = 0$      $x - 2 = 0$     ii) a.o.s:  $x = \frac{-4+2}{2}$   
 $x = -4$      $x = 2$      $x = -1$   
 $(-4, 0)$      $(2, 0)$

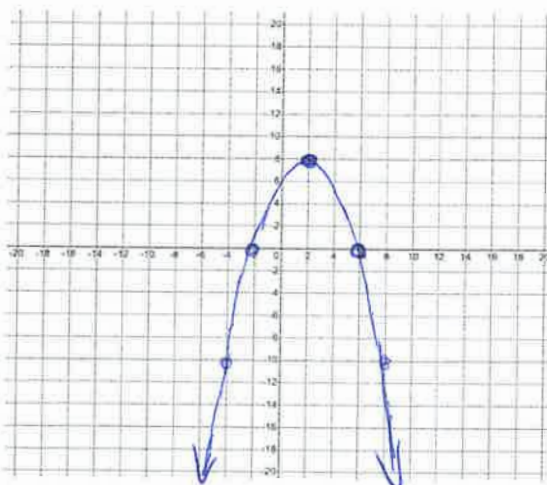
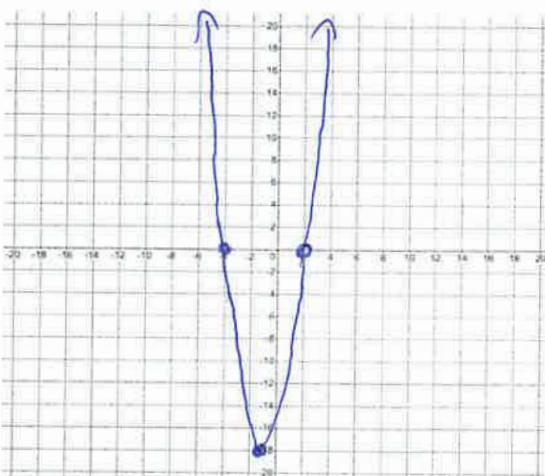
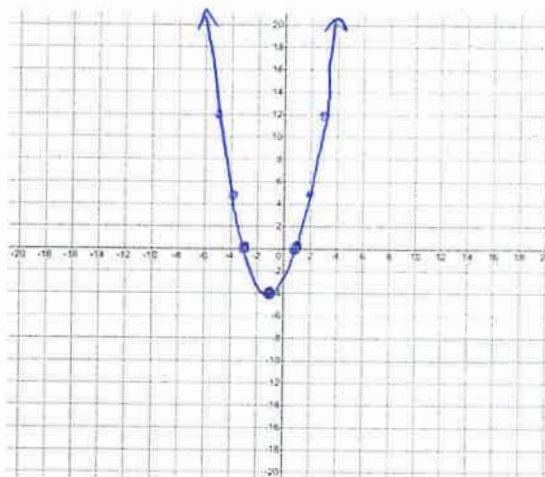
iii)  $x$ -vertex =  $-1$   
 $y$ -vertex =  $2(-1+4)(-1-2)$   
 $= 2(3)(-3)$   
 $= -18$   
 $(-1, -18)$

c)  $y = -\frac{1}{2}(x + 2)(x - 6)$

i)  $x + 2 = 0$      $x - 6 = 0$     ii) a.o.s:  $x = \frac{-2+6}{2}$   
 $x = -2$      $x = 6$      $x = 2$   
 $(-2, 0)$      $(6, 0)$

iii)  $x$ -vertex =  $2$   
 $y$ -vertex =  $-\frac{1}{2}(2+2)(2-6)$   
 $= -\frac{1}{2}(4)(-4)$   
 $= 8$

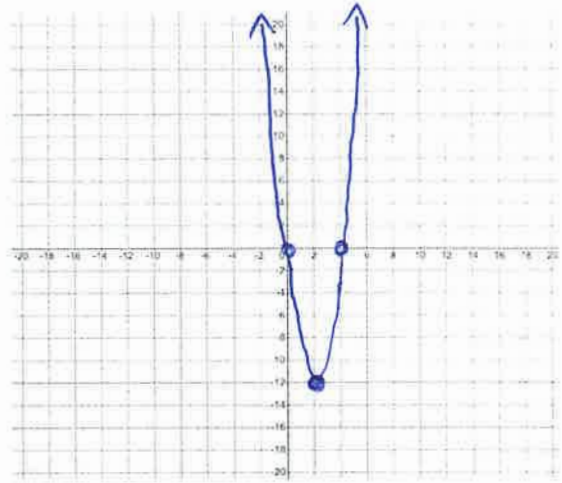
$(2, 8)$



d)  $y = 3x(x - 4)$

i)  $x=0$     $x-4=0$    ii) aos:  $x = \frac{0+4}{2}$   
                    $x=4$   
 (0,0)   (4,0)                     $x=2$

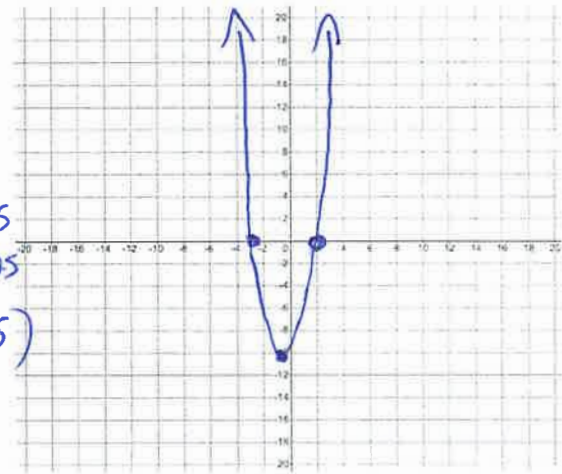
iii)  $x\text{-vertex} = 2$   
 $y\text{-vertex} = 3(2)(2-4)$   
                    $= -12$   
 (2, -12)



e)  $y = 2x^2 + x - 10$     $\frac{5}{5} x - \frac{4}{5} = -20$   
                                    $\frac{5}{5} + \frac{-4}{5} = 1$

$y = 2x^2 + 5x - 4x - 10$   
 $y = 2(2x+5) - 2(2x+5)$   
 $y = (2x+5)(x-2)$

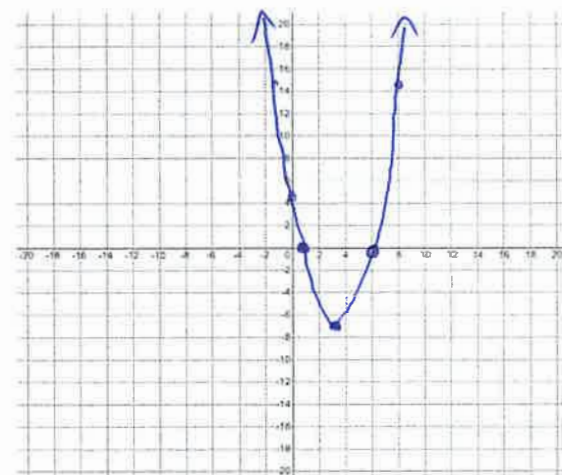
i)  $2x+5=0$     $x-2=0$    ii) aos:  $x = \frac{-5+2}{2}$    iii)  $x\text{-vertex} = -0.25$   
                    $2x = -5$     $x = 2$                                      $x = -\frac{1}{4}$                      $y\text{-vertex} = -10.125$   
                    $x = -\frac{5}{2}$    (2,0)                                     $(-0.25, -10.125)$   
 (-2.5, 0)



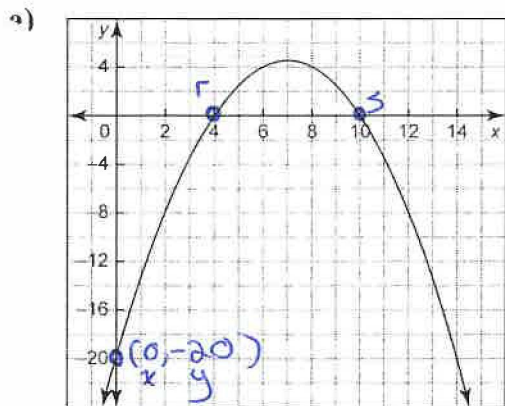
f)  $y = \frac{1}{4}(4x - 3)(x - 6)$

i)  $4x-3=0$     $x-6=0$    ii) aos:  $x = \frac{3+6}{2}$   
                    $4x = 3$     $x = 6$   
                    $x = \frac{3}{4}$    (6,0)  
 (0.75, 0)                                     $x = \frac{27}{8}$   
    $x = 3.375$

iii)  $x\text{-vertex} = 3.375$   
 $y\text{-vertex} = -6.891$   
 (3.375, -6.891)



2) Determine an equation in factored form to represent each parabola shown on the graph.



$$y = a(x-r)(x-s)$$

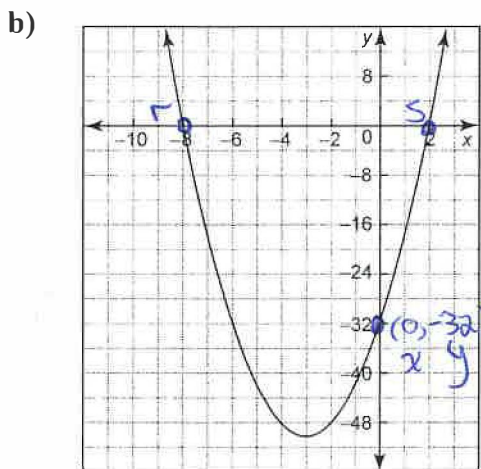
$$-20 = a(0-4)(0-10)$$

$$-20 = 40a$$

$$\frac{-20}{40} = a$$

$$a = -\frac{1}{2}$$

$$y = -\frac{1}{2}(x-4)(x-10)$$



$$y = a(x-r)(x-s)$$

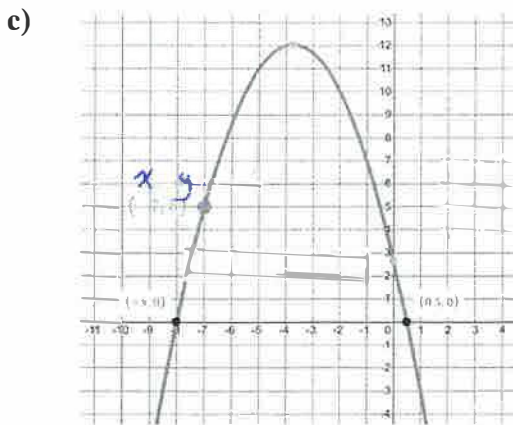
$$-32 = a(0+8)(0-2)$$

$$-32 = -16a$$

$$\frac{-32}{-16} = a$$

$$a = 2$$

$$y = 2(x+8)(x-2)$$



$$y = a(x+8)(2x-1)$$

$$5 = a(-7+8)[2(-7)-1]$$

$$5 = a(1)(-15)$$

$$5 = -15a$$

$$a = \frac{5}{-15}$$

$$a = -\frac{1}{3}$$

$$y = -\frac{1}{3}(x+8)(2x-1)$$

OR

$$y = a(x+8)(x-0.5)$$

$$5 = a(-7+8)(-7-0.5)$$

$$5 = a(1)(-7.5)$$

$$5 = -7.5a$$

$$a = \frac{5}{-7.5}$$

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

$$y = -\frac{2}{3}(x+8)(x-0.5)$$

3) A parabola has  $x$ -intercepts  $-2$  and  $-8$ , and has vertex  $(-5, -18)$ . Determine the equation of this parabola in the form  $y = a(x - r)(x - s)$

$$-18 = a [-5 - (-2)] [-5 - (-8)]$$

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

$$-18 = -9a$$

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

$$a = 2$$

$$y = 2(x+2)(x+8)$$

4) A parabola has  $x$ -intercepts  $3$  and  $7$ , and has vertex  $(5, 2)$ . Determine the equation of this parabola in factored form.

$$y = a(x-r)(x-s)$$

$$2 = a(5-3)(5-7)$$

$$2 = a(2)(-2)$$

$$2 = -4a$$

$$\frac{2}{-4} = a$$

$$a = -\frac{1}{2}$$

$$y = -\frac{1}{2}(x-3)(x-7)$$

5) Determine the  $x$ -intercepts of each of the following functions.

a)  $y = x^2 + 5x - 24$   $\frac{8}{x} \times \frac{-3}{-3} = -24$   
 $\frac{8}{x} + \frac{-3}{-3} = 5$

$$y = (x+8)(x-3)$$

$$0 = (x+8)(x-3)$$

$$x+8=0 \quad x-3=0$$

$$x=-8 \quad x=3$$

$$(-8, 0) \quad (3, 0)$$

b)  $y = x^2 - 11x + 10$   $\frac{-10}{x} \times \frac{-1}{-1} = 10$   
 $\frac{-10}{x} + \frac{-1}{-1} = -11$

$$y = (x-10)(x-1)$$

$$0 = (x-10)(x-1)$$

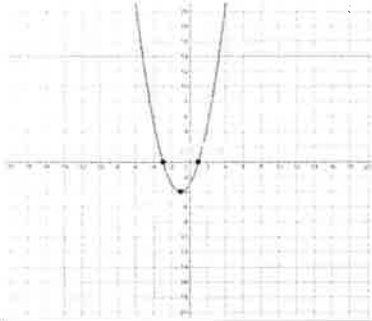
$$x-10=0 \quad x-1=0$$

$$x=10 \quad x=1$$

$$(10, 0) \quad (1, 0)$$

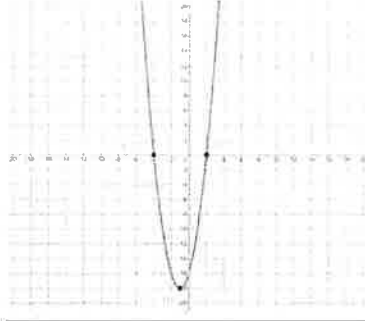
## Answers

1)a)



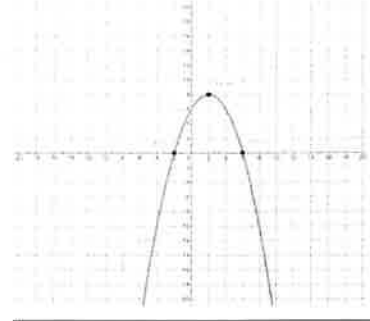
**x-int:**  $(-3,0), (1,0)$   
**axis of symmetry:**  $x = -1$   
**vertex:**  $(-1, -4)$

b)



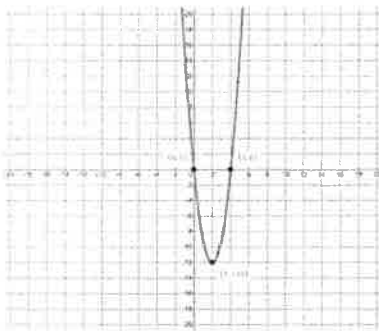
**x-int:**  $(-4,0), (2,0)$   
**axis of symmetry:**  $x = -1$   
**vertex:**  $(-1, -18)$

c)



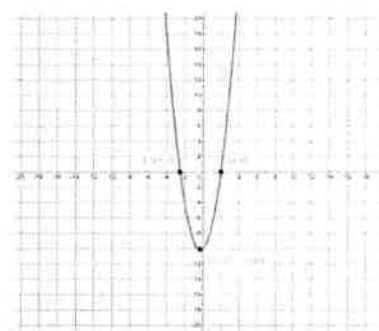
**x-int:**  $(-2,0), (6,0)$   
**axis of symmetry:**  $x = 2$   
**vertex:**  $(2,8)$

d)



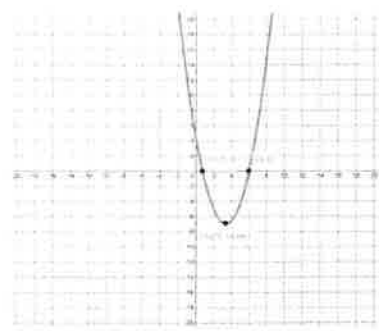
**x-int:**  $(0,0), (4,0)$   
**axis of symmetry:**  $x = 2$   
**vertex:**  $(2, -12)$

e)



**x-int:**  $(-2.5,0), (2,0)$   
**axis of symmetry:**  $x = -0.25$   
**vertex:**  $(-0.25, -10.125)$

f)



**x-int:**  $(0.75,0), (6,0)$   
**axis of symmetry:**  $x = 3.375$   
**vertex:**  $(3.375, -6.891)$

2)a)  $y = -\frac{1}{2}(x - 4)(x - 10)$    b)  $y = 2(x + 8)(x - 2)$    c)  $y = -\frac{1}{3}(2x - 1)(x + 8)$

3)  $y = 2(x + 2)(x + 8)$

4)  $y = -\frac{1}{2}(x - 3)(x - 7)$

5)a)  $(-8,0)$  and  $(3,0)$    b)  $(10,0)$  and  $(1,0)$