**W5 – 2.4 – Families of Polynomial Functions**
**MHF4U**

, The zeros of a quadratic function are -7 and -3.

**a)** Determine an equation for the family of quadratic functions with these zeros.

$y = k(x+7)(x+3)$

**b)** Write equations for two functions that belong to this family.

$y = 87(x+7)(x+3)$

$y = 71(x+7)(x+3)$

**c)** Determine an equation for the member of the family that passes through the point (2, 18).

$18 = k(2+7)(2+3)$

$18 = 45k$

$k = \frac{2}{5}$

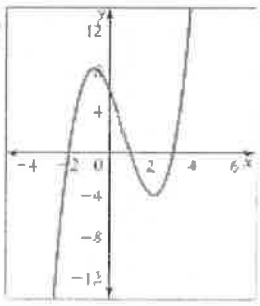
$y = \frac{2}{5}(x+7)(x+3)$

**2)** Examine the following functions. Which function does not belong to the same family?

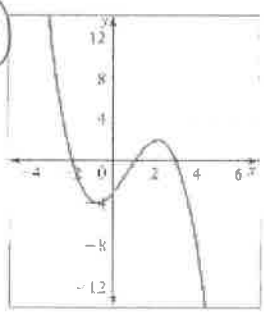
**a)** $y = 1.5(x+4)(x-5)(x-2)$
**b)** $y = -1.5(x-2)(x-5)(x+4)$
**c)** $y = 1.5(x-2)(x+4)(x-2)$
**d)** $y = 3(x-5)(x-2)(x+4)$

**3)** The graphs of four polynomial functions are given. Which graphs represent functions that belong to the same family?

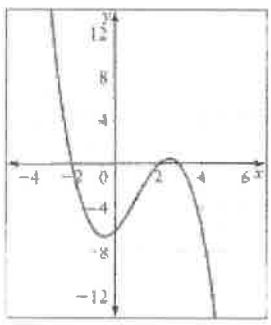
A)



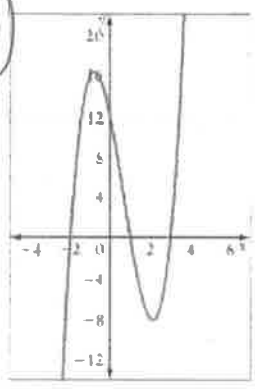
B)



C)



D)



**4)a)** Determine an equation for the family of cubic functions with zeros -2, -1, and $\frac{1}{2}$

$y = k(x+2)(x+1)(2x-1)$

**b)** Write equations for two functions that belong to this family.

$y = 66(x+2)(x+1)(2x-1)$

$y = 68(x+2)(x+1)(2x-1)$

**c)** Determine an equation for the member of the family whose graph has a $y$-intercept of 6.

$6 = k(0+2)(0+1)[2(0)-1]$

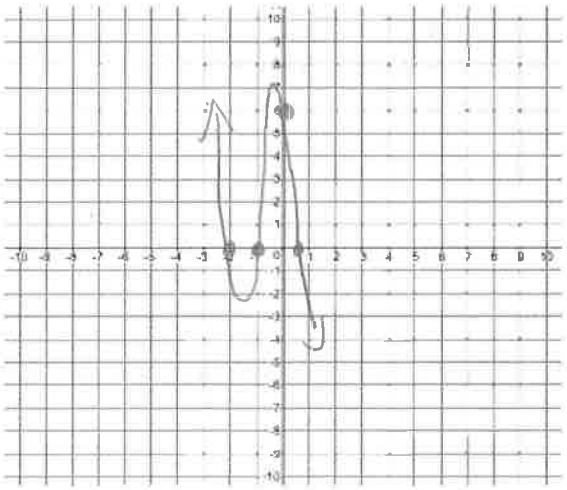
$6 = k(2)(1)(-1)$

$6 = -2k$

$k = -3$

$y = -3(x+2)(x+1)(2x-1)$

**d)** Sketch a graph of the function from part c).



**5)a)** Determine an equation for the family of cubic functions with zeros $1 \pm \sqrt{2}$ and $-\frac{1}{2}$

factors: $x = 1 \pm \sqrt{2}$ $\quad x = -\frac{1}{2}$

$x - 1 = \pm\sqrt{2}$ $\quad 2x = -1$

$(x-1)^2 = 2$ $\quad 2x+1 = 0$

$x^2 - 2x + 1 = 2$ $\quad (2x+1)$

$x^2 - 2x - 1 = 0$

$(x^2 - 2x - 1)$

$y = k(x^2 - 2x - 1)(2x+1)$

**b)** Determine an equation for the member of the family whose graph passes through the point (3, 35).

$35 = k[(3)^2 - 2(3) - 1][2(3)+1]$

$35 = k(2)(7)$

$35 = 14k$

$\frac{35}{14} = k$

$k = \frac{5}{2}$

$$y = \frac{5}{2}(x^2 - 2x - 1)(2x+1)$$

**6)a)** Determine an equation for the family of quartic functions with zeros 3 (order 2) and $-4 \pm \sqrt{3}$.

Factors: $x = 3$

$x - 3 = 0$

$(x-3)^2$

$x = -4 \pm \sqrt{3}$

$x + 4 = \pm\sqrt{3}$

$(x+4)^2 = 3$

$x^2 + 8x + 16 = 3$

$x^2 + 8x + 13 = 0$

$(x^2 + 8x + 13)$

$$y = k(x-3)^2(x^2+8x+13)$$

**b)** Determine an equation for the member of the family whose graph passes through the point (1, -22).

$-22 = k(1-3)^2[(1)^2 + 8(1) + 13]$

$-22 = k(4)(22)$

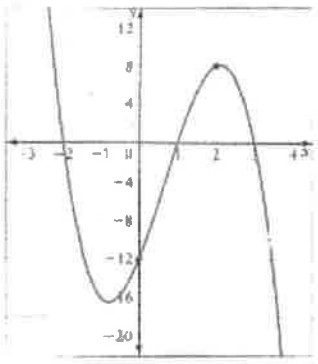
$-1 = 4k$

$k = -\frac{1}{4}$

$$y = -\frac{1}{4}(x-3)^2(x^2+8x+13)$$

**7)** Determine an equation for each of the following functions

**a)**



$y = k(x+2)(x-1)(x-3)$

$-12 = k(0+2)(0-1)(0-3)$

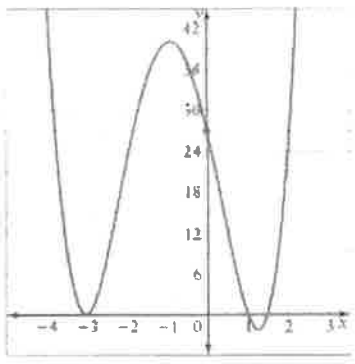
$-12 = k(2)(-1)(-3)$

$-12 = 6k$

$k = -2$

$y = -2(x+2)(x-1)(x-3)$

**b)**



$y = k(x+3)^2(x-1)(2x-3)$

$27 = k(0+3)^2(0-1)[2(0)-3]$

$27 = k(9)(-1)(-3)$

$27 = 27k$

$k = 1$

$y = (x+3)^2(x-1)(2x-3)$

**ANSWER KEY**

**1)a)** $y = k(x+7)(x+3)$ **b)** answer will vary **c)** $y = \frac{2}{5}(x+7)(x+3)$ **2)** C **3)** A, B, D

**4)a)** $y = k(x+2)(x+1)(2x-1)$ **b)** answer wil vary **c)** $y = -3(x+2)(x+1)(2x-1)$ **d)** see posted

**5)a)** $y = k(x^2-2x-1)(2x+1)$ **b)** $y = \frac{5}{2}(x^2-2x-1)(2x+1)$

**6)a)** $y = k(x-3)^2(x^2+8x+13)$ **b)** $y = -\frac{1}{4}(x-3)^2(x^2+8x+13)$

**7)a)** $y = -2(x+2)(x-1)(x-3)$ **b)** $y = (x+3)^2(x-1)(2x-3)$