

W5 – 2.4 – Families of Polynomial Functions

MHF4U

Jensen

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?

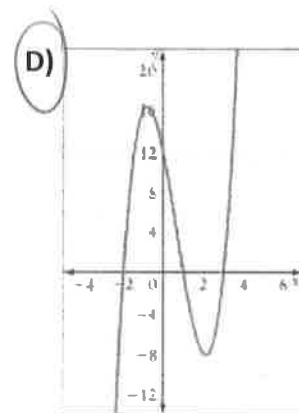
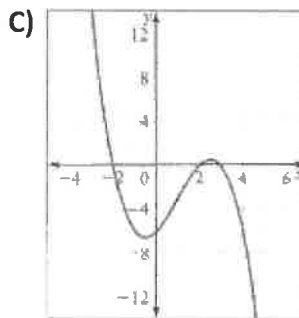
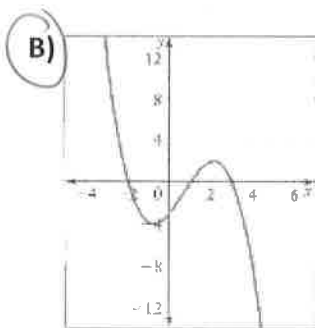
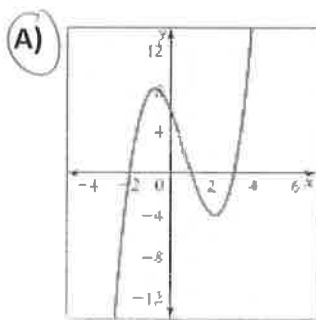
a)  $y = 1.5(x+4)(x-5)(x-2)$

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?



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.

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

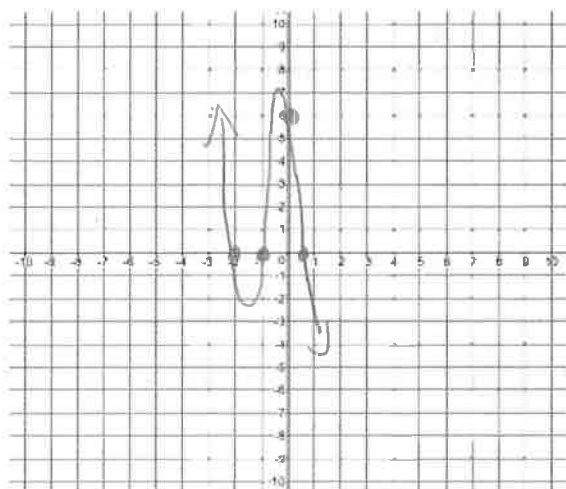
$$6 = k(2)(1)(-1)$$

$$6 = -2k$$

$$k = -3$$

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

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:  $x = 1 \pm \sqrt{2}$

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

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

$$x^2 - 2x + 1 = 2$$

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

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

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

$$2x = -1$$

$$2x+1 = 0$$

$$(2x+1)$$

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

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).

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

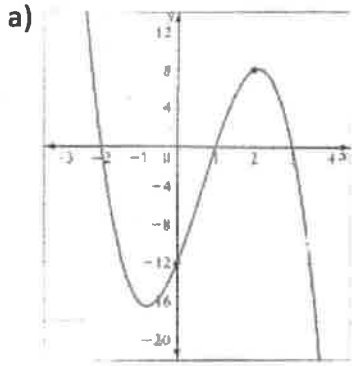
$$-22 = k (4)(22)$$

$$-1 = 4k$$

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

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

7) Determine an equation for each of the following functions



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

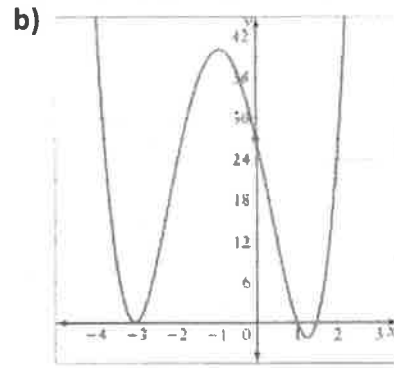
$$-12 = k(0+2)(0-1)(0-3)$$

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

$$-12 = 6k$$

$$k = -2$$

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



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

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

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

$$27 = 27k$$

$$k = 1$$

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

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