

2.5 Families of Polynomial Functions Worksheet with solutions

This document was composed and formatted by Annie Bernatchez.

The course material originated from www.jensenmath.ca

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

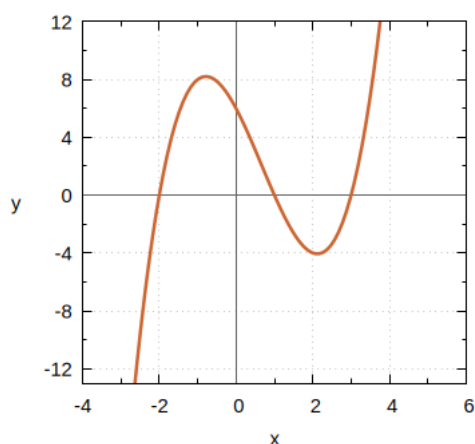
c) $y = 1.5(x - 2)(x + 4)(x - 2)$

d) $y = 3(x - 5)(x - 2)(x + 4)$

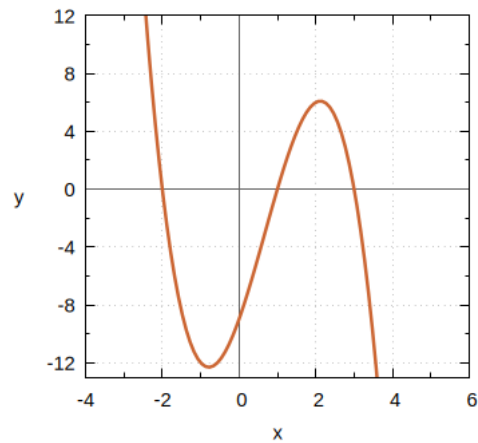
Answer: c)—it has a repeated root at $x = 2$ instead of the shared zeros -4, 2, and 5.

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

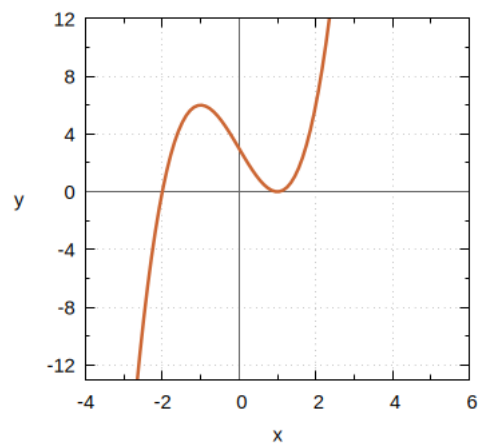
A)



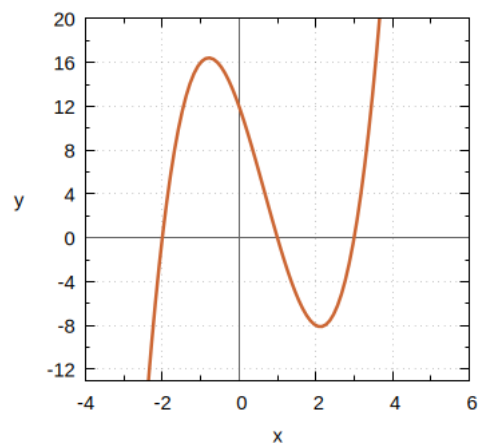
B)



C)



D)



Answer: **A, B, and D** belong to the same family (zeros -2 , 1 , and 3); **C** does not (it has a repeated zero at $x = 1$ and no zero at $x = 3$).

4)

a) Determine an equation for the family of cubic functions with zeros -2 , -1 , and $1/2$

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

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.

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

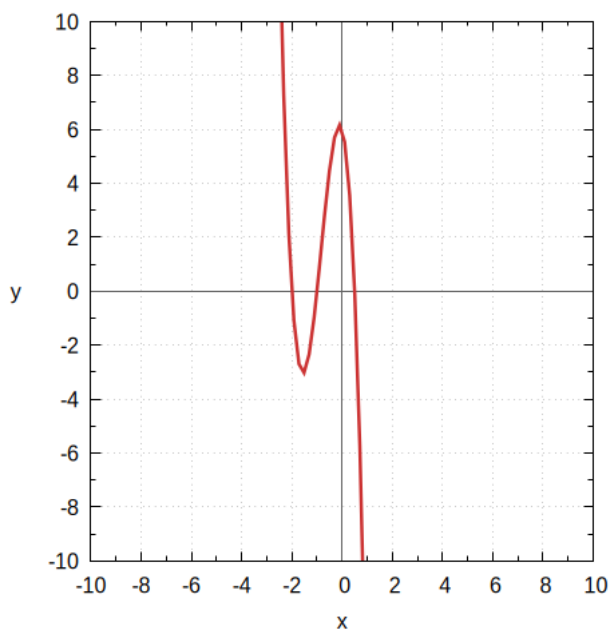
$$6 = k(2)(1)(-1)$$

$$6 = -2k$$

$$k = -3$$

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

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:

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

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

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

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

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

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

$$2x = -1$$

$$2x + 1 = 0$$

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

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

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

$$35 = k(2)(7)$$

$$35 = 14k$$

$$k = \frac{35}{14} = \frac{5}{2}$$

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

6)

6)

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

Factors:

$$x = 3 \text{ (order 2)} \rightarrow (x - 3)^2$$

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

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

$$(x + 4)^2 = 3$$

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

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

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

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

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

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

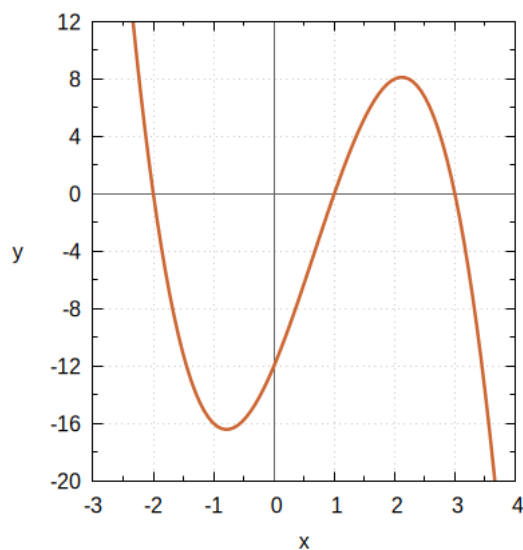
$$-22 = 88k$$

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

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

7) Determine an equation for each of the following functions

a)



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

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

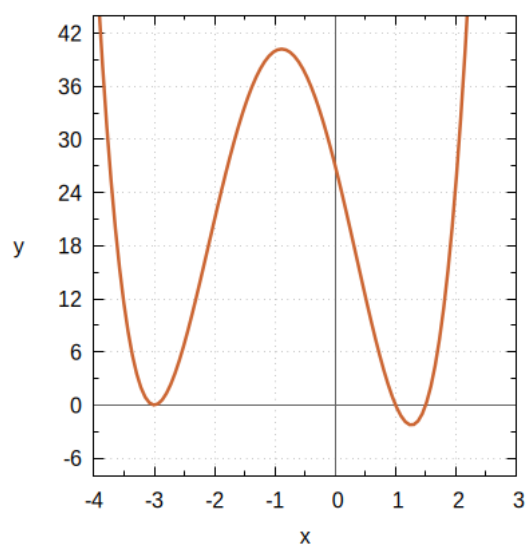
$$-12 = k(2)(-1)(-3)$$

$$-12 = 6k$$

$$k = -2$$

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

b)



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

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

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

$$27 = 27k$$

$$k = 1$$

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