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

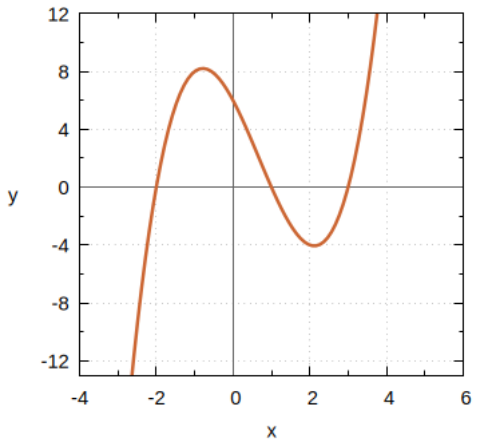
c) $y = 1.5(x - 2)(x + 4)(x - 2)$

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.

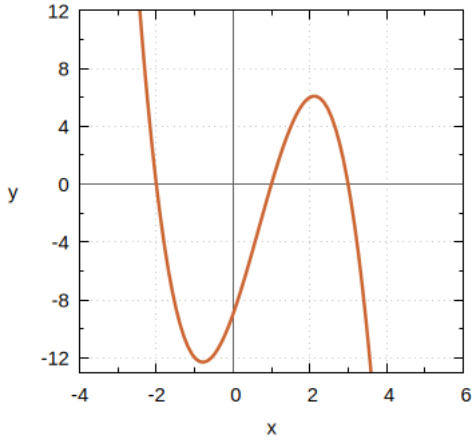
3) The graphs of four polynomial functions are given. Which graphs represent functions that belong to the same family?

A)

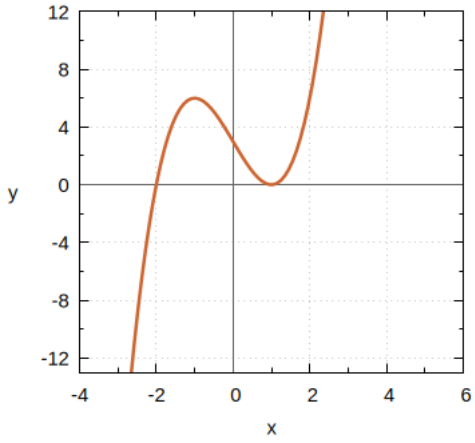


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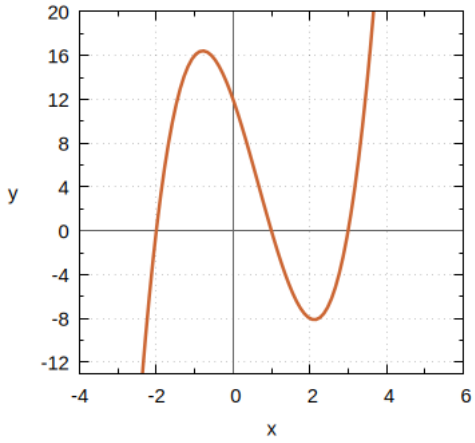
B)



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.

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

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

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

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

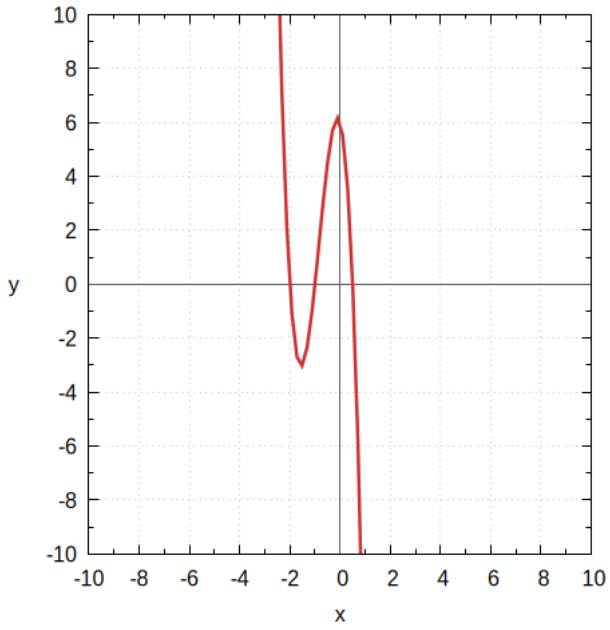
$6 = k(2)(1)(-1)$

$6 = -2k$

$k = -3$

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

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)

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6)

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

Factors:

$x = 3$ (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 $(1, -22)$.

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

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

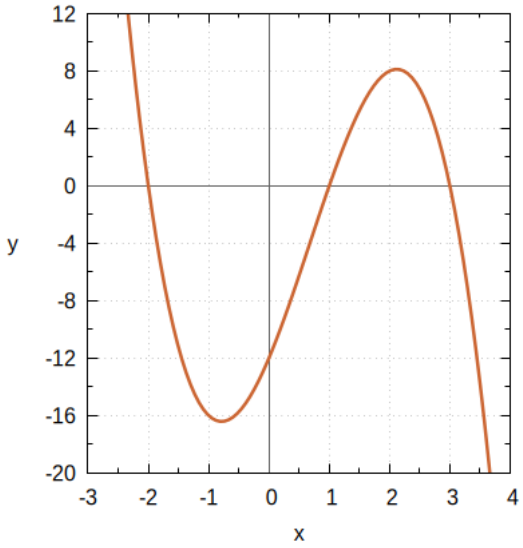
$-22 = 88k$

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

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

7) Determine an equation for each of the following functions

a)



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

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

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

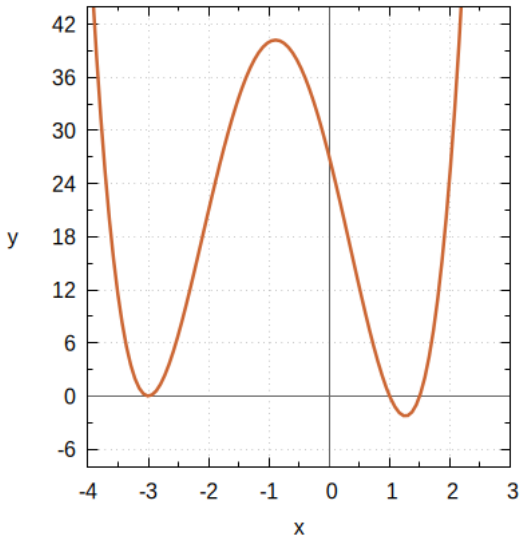
$-12 = 6k$

$k = -2$

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

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b)



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

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

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

$27 = 27k$

$k = 1$

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

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