Zeros of a Function

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PRE-CALCULUS 11
QUADRATIC FUNCTIONS
ZEROS OF A FUNCTION

A. Definitions

1. **function:** a graphical representation of an equation.
2. **linear function:** a function that can be written in the form $y = mx + b$ or $f(x) = mx + b$.
3. **quadratic function:** a function that can be written in the form $y = ax^2 + bx + c$ or $f(x) = ax^2 + bx + c$.
4. **roots/zeros:** the answer(s) to an equation.
5. **x-intercept:** the place where the shape crosses the x-axis. These are also referred to as the roots or zeros of the function.
6. **y-intercept:** the place where the shape crosses the y-axis. In the form of the quadratic function the c value represents the y-intercept.

B. Determining the Roots of Equations

Find the roots of the following equations.

1) $3x - 2 = -14$

$+2 \quad +2$

$\frac{3}{3}x = \frac{-12}{3}$

$x = -4$

2) $0 = 3(x-2)(x+5)$

$0 = x - 2 \quad (+2) \qquad 0 = x + 5 \quad (-5)$

$x = 2, -5$

3) $2x^2 - 98 = 0$

$2(x^2 - 49) = 0$

$2(x+7)(x-7) = 0$

$x + 7 = 0 \quad (-7) \qquad x - 7 = 0 \quad (+7)$

$x = \pm 7$

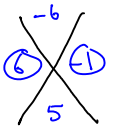
4) $x^3 + 5x^2 - 6x = 0$

$x(x^2 + 5x - 6) = 0$

$x(x+6)(x-1) = 0$

$x = 0 \qquad x + 6 = 0 \quad (-6) \qquad x - 1 = 0 \quad (+1)$

$x = 0, -6, 1$



C. Determining Zeros of a Function

Find the zeros of the following functions.

1) $f(x) = 2x + 10$

$0 = 2x + 10$

$-10 \quad -10$

$\frac{-10}{2} = \frac{2x}{2}$

$x = -5$

x-intercept

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

$4\left[0 = \frac{x}{4} - 1\right]$

$0 = x - 4$

$+4 \quad +4$

$x = 4$

3) $h(x) = x^2 - 7x + 12$

12, -3, -4, -7

$0 = x^2 - 7x + 12$

$0 = (x - 3)(x - 4)$

$0 = x - 3$ $\quad$ $0 = x - 4$

$+3 \quad +3$ $\quad$ $+4 \quad +4$

$x = 3, 4$

x-intercepts

4) $p(x) = 2x^2 - 5x - 3$

-6, -6, 1, -5

$0 = 2x^2 - 5x - 3$

$0 = (x - \frac{6}{2})(x + \frac{1}{2})$

$0 = (x - 3)(2x + 1)$

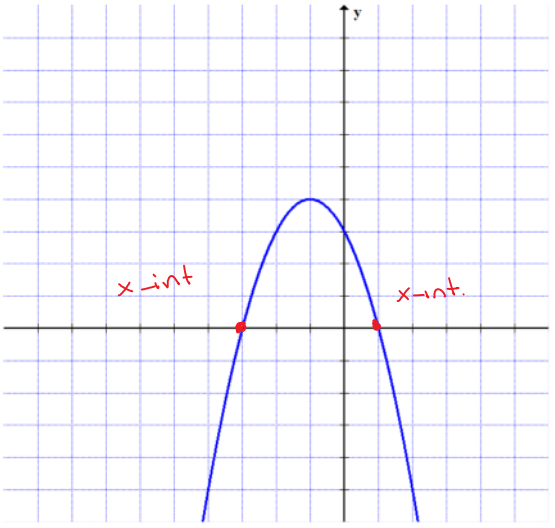
$0 = x - 3$ $\quad$ $0 = 2x + 1$

$+3 \quad +3$ $\quad$ $-1 \quad -1$

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

$x = 3, -\frac{1}{2}$

5)



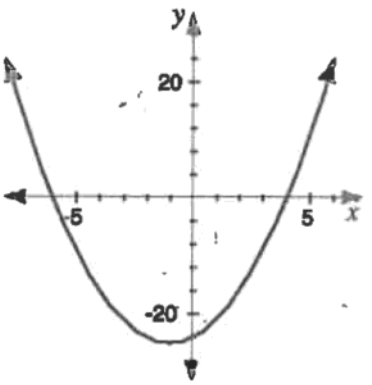
The zeros are the x-intercepts

$x = -3, 1$

Assignment : Zeros of a Functions Assignment #1, 2, 3, 4i only

Assignment

1. The graph represents a function, f. The x and y-intercepts of the graph are integers.



a) State the x and y-intercepts of the graph.

b) State the zeros of the function f.

2. Find the roots of the following equations.

a) $x^2 + 5x + 6 = 0$ b) $2x + 5 = 0$ c) $2x(x + 3) = 0$

d) $2x^2 - 10x + 12 = 0$ e) $x^2 - 64 = 0$ f) $x^2 - 16x + 64 = 0$

g) $x^2 - 6x = 16$ h) $x^3 + 8x^2 = 20x$ i) $4x^2 + 4x - 3 = 0$

3. Find the zeros of the following functions.

a) $f(x) = \frac{x}{3} + 5$ b) $g(x) = x^2 - 20x + 36$ c) $P(x) = 3(2x - 5)(x + 1)$

d) $g(x) = 25x^2 - 64$ e) $f(x) = 3x - 7$ f) $h(x) = x^2$

g) $f(x) = x^4 - 16$ h) $P(x) = x(x-3)(2x+1)$ i) $f(x) = 30x^2 + 140x - 50$

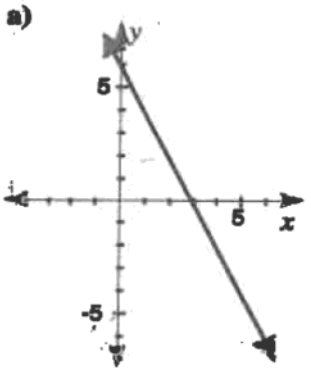
4. For the following functions:
i) Find the zeros
ii) Find the y-intercept of the graph of the function.

a) $f(x) = 3(x-5)(5x-9)$ b) $f(x) = 5x^2 - 35x$ c) $f(x) = 3x(x^2 - 49)$

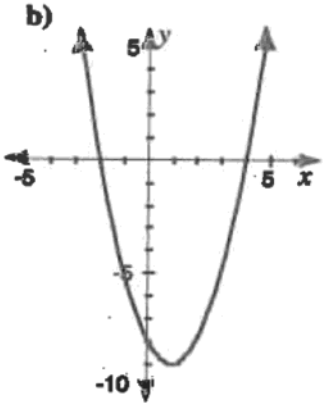
d) $f(x) = 2x^2 - x - 15$ e) $P(x) = 8x^2 + 14x - 15$ f) $g(x) = 2x^2 - 56x - 120$

5. In each case the graph of a function is shown where the x and y-intercepts are integers. Determine the:
- zeros of the function,
- factors of the equation of the function, and,
- y-intercept of the graph of the function.

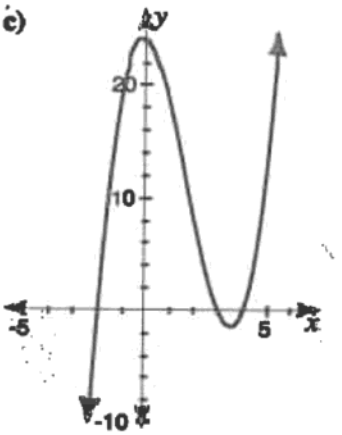
a)



b)



c)



Answer Key

1. a) x-intercepts are $-6, 4$ and y-intercept is -24. b) $-6, 4$

2. a) $-3, -2$ b) $-\frac{5}{2}$ c) $-3, 0$ d) $2, 3$ e) $-8, 8$
   f) 8 g) $-2, 8$ h) $-10, 0, 2$ i) $-\frac{3}{2}, \frac{1}{2}$

3. a) -15 b) $2, 18$ c) $-1, \frac{5}{2}$ d) $-\frac{8}{5}, \frac{8}{5}$ e) $\frac{7}{3}$
   f) 0 g) $-2, 2$ h) $-\frac{1}{2}, 0, 3$ i) $-5, \frac{1}{3}$

4. a) i) $\frac{9}{5}, 5$ ii) 135 b) i) $0, 7$ ii) 0 c) i) $-7, 0, 7$ ii) 0
   d) i) $-\frac{5}{2}, 3$ ii) -15 e) i) $-\frac{5}{2}, \frac{3}{4}$ ii) -15 f) i) $-2, 30$ ii) -120

5. a) zero: 3
   factor: $x - 3$
   y-intercept: 6

   b) zeros: $-2, 4$
   factors: $x + 2, x - 4$
   y-intercept: -8

   c) zeros: $-2, 3, 4$
   factors: $x + 2, x - 3, x - 4$
   y-intercept: 24