Solutions

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1. Determine the vertex and the direction of opening for each quadratic function. Then state the number of zeros.

a) $f(x) = 3x^2 - 5$

Vertex $(0,-5)$
Opens up
a and k different $\Rightarrow$ 2 zeros

d) $f(x) = 3(x+2)^2$

Vertex $(-2,0)$
opens up
$k=0 \Rightarrow$ 1 zero

b) $f(x) = -4x^2 + 7$

Vertex $(0,7)$
opens down
a and k different $\Rightarrow$ 2 zeros

e) $f(x) = -4(x+3)^2 - 5$

Vertex $(-3,-5)$
opens down
a and k same $\Rightarrow$ 0 zeros

c) $f(x) = 5x^2 + 3$

Vertex $(0,3)$
opens up
a and k same $\Rightarrow$ 0 zeros

f) $f(x) = 0.5(x-4)^2 - 2$

Vertex $(4,-2)$
opens up
a and k different
$\Rightarrow$ 2 zeros

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3. Calculate the value of $b^2 - 4ac$ to determine the number of zeros.

a) $f(x) = 2x^2 - 6x - 7$

$b^2 - 4ac$
$= (-6)^2 - 4(2)(-7)$
$= 36 - (-56)$
$= 92 \Rightarrow > 0$
$\Rightarrow$ 2 solutions

b) $f(x) = 3x^2 + 2x + 7$

$b^2 - 4ac$
$= 2^2 - 4(3)(7)$
$= 4 - 84$
$= -80 \Rightarrow < 0$
$\Rightarrow$ 0 solutions

c) $f(x) = x^2 + 8x + 16$

$b^2 - 4ac$
$= 8^2 - 4(1)(16)$
$= 64 - 64$
$= 0$
$\Rightarrow$ 1 solution

d) $f(x) = 9x^2 - 14.4x + 5.76$

$b^2 - 4ac$
$= (-14.4)^2 - 4(9)(5.76)$
$= 207.36 - 207.36$
$= 0$
$\Rightarrow$ 1 solution

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4. Determine the number of zeros. Do not use the same method for all four parts.

K

a) $f(x) = -3(x - 2)^2 + 4$

$a = -3$
$k = 4$
different signs
$\Rightarrow$ 2 solutions

b) $f(x) = 5(x - 3)(x + 4)$

Already factored
2 factors with x
$\Rightarrow$ 2 solutions

c) $f(x) = 4x^2 - 2x$

$= (2x)(2x - 1)$
$\Rightarrow$ 2 factors with x
$\Rightarrow$ 2 solutions

d) $f(x) = 3x^2 - x + 5$

$b^2 - 4ac$
$= (-1)^2 - 4(3)(5)$
$= 1 - 60$
$= -59 \Rightarrow < 0$
$\Rightarrow$ 0 solutions

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5. For each profit function, determine whether the company can break even. If
A the company can break even, determine in how many ways it can do so.

a) $P(x) = -2.1x^2 + 9.06x - 5.4$

$b^2 - 4ac$
$= (9.06)^2 - 4(-2.1)(-5.4)$
$= 82.0836 - 45.36$
$= 36.7236 > 0$
Yes, in 2 ways

b) $P(x) = -0.3x^2 + 2x - 7.8$

$b^2 - 4ac$
$= 2^2 - 4(-0.3)(-7.8)$
$= 4 - 9.36$
$= -5.36 < 0$
$\Rightarrow$ No, can't break even

c) $P(x) = -2x^2 + 6.4x - 5.12$

$b^2 - 4ac$
$= (6.4)^2 - 4(-2)(-5.12)$
$= 40.96 - 40.96$
$= 0$
Yes, in 1 way

d) $P(x) = -2.4x^2 + x - 1.2$

$b^2 - 4ac$
$= (1)^2 - 4(-2.4)(-1.2)$
$= 1 - 11.52$
$= -10.52 < 0$
$\Rightarrow$ No, can't break even

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6. For what value(s) of k will the function $f(x) = 3x^2 - 4x + k$ have one x-intercept?

To have one x-intercept
$b^2 - 4ac = 0$ (1 solution)

$\Rightarrow (-4)^2 - 4(3)(k) = 0$
$16 - 12k = 0$
$\frac{16}{12} = \frac{12k}{12}$
$\frac{4}{3} = k$

$\Rightarrow k = \frac{4}{3}$ will give one x-intercept

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