3.6 Zeros of a Quadratic

Mar 24

Determine the number of zeros in each quadratic.

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

No zeros

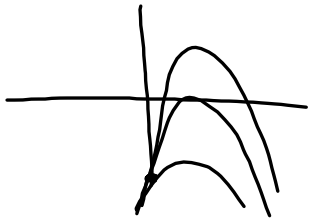
$f(x) = 2(x+3)^2 - 4$

2 zeros

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

1 zero

$f(x) = -2x^2 + 12x - 18$

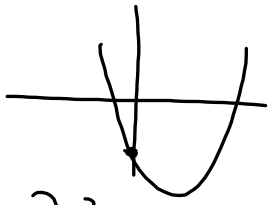


ATTEMPT FACTORING

$f(x) = -2(x^2 - 6x + 9)$

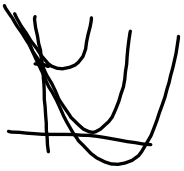
$= -2(x-3)^2$ ∴ 1 zero

$f(x) = 2x^2 + 6x - 8$



2 zeros

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



QF → $x = \dfrac{4 \pm \sqrt{4^2 - 4(7)}}{2}$

$= \dfrac{4 \pm \sqrt{-12}}{2}$ ← IMPOSSIBLE

∴ No zeros

The Discriminant

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \longrightarrow D = b^2 - 4ac$$

$\mathbb{R}$

$D > 0$, 2 zeros (2 real roots)

$D = 0$, $x = -b/2a$ → 1 zero

$D < 0$, 0 zeros (0 real roots)

imaginary roots $\sqrt{-1}$

Determine the number of zeros for each quadratic

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

$D = b^2 - 4ac$
$= (-3)^2 - 4(2)(-5)$
$= 9 + 40$
$= 49$
> 0
∴ 2 zeros

$f(x) = 4x^2 + 4x + 1$

$D = b^2 - 4ac$
$= 4^2 - 4(4)$
$= 0$
∴ 1 zero

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

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

$D = b^2 - 4ac$
$= 1^2 - 4(-5)(-2)$
$= 1 - 40$
$= -39$
< 0
∴ no zeros

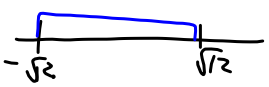
Determine the values of k such that the function has one, two, or no zeros $f(x) = x^2 - kx + 3$

$D = b^2 - 4ac$
$= (-k)^2 - 4(3)$
$= k^2 - 12$

One zero
$k^2 - 12 = 0$
$k^2 = 12$
$k = \pm\sqrt{12}$ ($\sqrt{4 \times 3}$)
$k = \pm 2\sqrt{3}$

Two zeros
$k^2 - 12 > 0$
$k^2 > 12$
$k < -\sqrt{12}$, $k > \sqrt{12}$

No zeros
$k^2 - 12 < 0$
$k^2 < 12$
$k > -\sqrt{12}$, $k < \sqrt{12}$



∴ One zero $k = \pm 2\sqrt{3}$
Two zeros $k < -2\sqrt{3}$, $k > 2\sqrt{3}$
No zeros $-2\sqrt{3} < k < 2\sqrt{3}$

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