Predicting the Number of Roots of Quadratics

Apr. 27 / 2016

Recall: For a quadratic relation
roots = zeroes = x-intercept = solutions

Given vertex form, look at:
- the location of the vertex (above/below x-axis?)
- the direction of opening (up/down?)

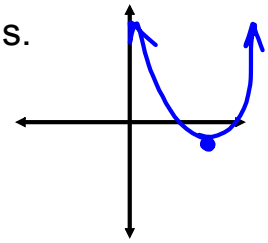
Ex.1 $y = 3(x - 5)^2 - 1$

V(5 , -1)

The vertex lies **above/below?** the x - axis.

The parabola opens **up/down?**

zero(es): 2



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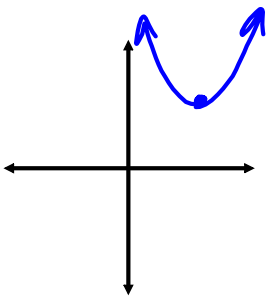
Ex. $y = 3(x - 5)^2 + 6$, Vertex(5, 6)

above/below? the x-axis

opens **up/down?**

zero(es): 0

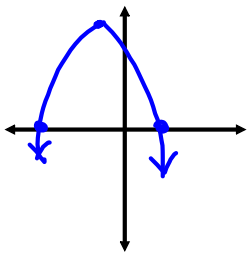


Ex. $y = -0.5(x + 3)^2 + 11$, Vertex (-3, 11)

above/below? the x-axis

opens **up/down?**

zero(es): 2



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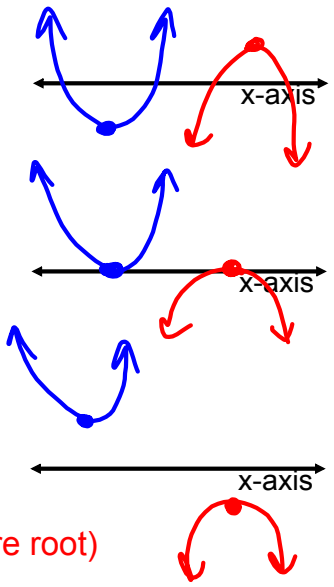
From the quadratic formula:

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

$D = b^2 - 4ac$ is called the discriminant.

It tells you how many zeros the quadratic has.

D is positive $b^2 - 4ac > 0$	two real roots
D is zero $b^2 - 4ac = 0$	one real root (double root)
D is negative $b^2 - 4ac < 0$ (because you cannot take a negative square root)	no real roots



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Ex.2 Find how many zeros each of the following quadratic relations has using the discriminant.

(a) $y = x^2 - 6x + 7$

(b) $y = 2x^2 - 5x + 9$

(c) $y = x^2 + 3x - 11$

(d) $y = 9x^2 - 24x + 16$

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Assigned Work:

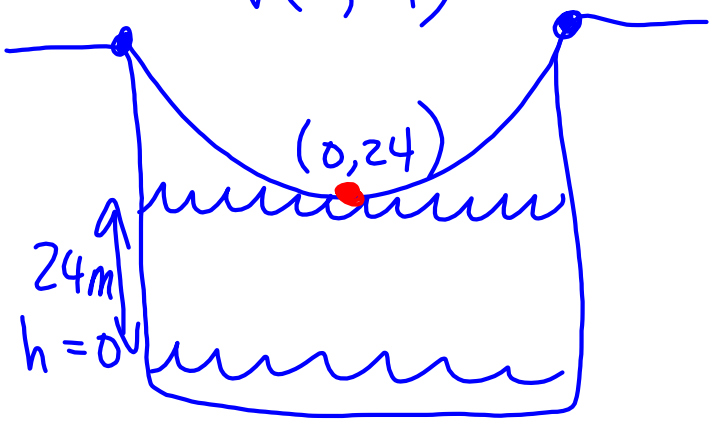
p.350 # 2, 3, 4, 5, 7, 9, 10, 12

$y = a(x-h)^2 + k$

7. $h = 0.005x^2 + 24$

$h = 0.005(x-0)^2 + 24$

$V(0, 24)$



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10. $y = 5x^2 + 6x + k$

(a) 2 roots $36 - 20k > 0$

(b) 1 root $36 - 20k = 0$ ← 1.8

(c) 0 roots $36 - 20k < 0$

$D = b^2 - 4ac$

$= (6)^2 - 4(5)(k)$

$= 36 - 20k$

(b) $36 - 20k = 0$

$\frac{36}{20} = \frac{20k}{20}$

$k = \frac{36}{20}^{9}_{5}$

$k = \frac{9}{5}$

$= 1.8$

try $k > 1.8$, $k = 2$

$D = 36 - 20k$

$= 36 - 20(2)$

$= 36 - 40$

$= -4$ ← 0 solutions

try $k < 1.8$, $k = 0$

$D = 36 - 20(0)$

$= 36$ ← 2 solutions

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12. $y = 4x^2 + 24x - 5$

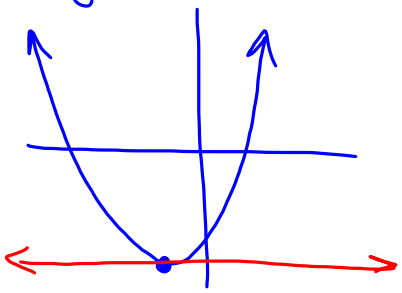
$y = 4[x^2 + 6x] - 5$

$y = 4[x^2 + 6x + 9 - 9] - 5$

$y = 4[(x+3)^2 - 9] - 5$

$y = 4(x+3)^2 - 36 - 5$

$y = 4(x+3)^2 - 41$ $V(-3, -41)$



$y < -41$ will have no solutions.

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