Algebra 1

Chapter 9

Section 9-5

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Review: Factoring

$x^2 + 10x + 25$

$(x+5)(x+5)$

$(x+5)^2$

$x^2 - 12x + 36$

$(x-6)(x-6)$

$(x-6)^2$

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x^2+bx+c

9-5: Completing the Square

In general, you can change the expression $x^2 + bx$ into a perfect-square trinomial by adding $\left(\frac{b}{2}\right)^2$ to $x^2 + bx$. This process is called **completing the square**. The process is the same whether b is positive or negative.

$c=\left(\frac{b}{2}\right)^2$

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Complete each square by adding another term

$x^2 + 14x$

$b=14$

$c=\left(\frac{b}{2}\right)^2$

$c=\left(\frac{14}{2}\right)^2=7^2=49$

$x^2+14x+49$

$k^2 - 40k$

$b=-40$

$c=\left(\frac{b}{2}\right)^2$

$c=\left(\frac{-40}{2}\right)^2=(-20)^2$

$c=400$

$k^2-40k+400$

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Using completing the square to solve equations.

$r^2 + 4r = 32$

$+4 \quad +4$

$b = 4$

$c = \left(\frac{4}{2}\right)^2 = 4$

$r^2 + 4r + 4 = 36$

$(r+2)(r+2) = 36$

$\sqrt{(r+2)^2} = \sqrt{36}$

$r + 2 = \pm 6$

$r + 2 = 6$ or $r + 2 = -6$

$-2 \quad -2 \qquad -2 \quad -2$

$r = 4$ or $r = -8$

$a^2 - 12a + 35 = 0$

$-35 \quad -35$

$a^2 - 12a + 36 = -35 + 36$

$b = -12$

$c = \left(\frac{-12}{2}\right)^2 = 36$

$a^2 - 12a + 36 = 1$

$(a-6)(a-6) = 1$

$\sqrt{(a-6)^2} = \sqrt{1}$

$a - 6 = \pm 1$

$a - 6 = 1$ or $a - 6 = -1$

$+6 \quad +6 \qquad +6 \quad +6$

$a = 7 \qquad a = 5$

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Using completing the square to solve equations.

Round answers to the nearest tenth.

$r^2 + 24r = -54$

$+144 \quad +144$

$b = 24$

$c = \left(\frac{24}{2}\right)^2$

$c = 12^2 = 144$

$r^2 + 24r + 144 = 90$

$\sqrt{(r+12)^2} = \sqrt{90}$

$r + 12 = \pm 9.5$

$r + 12 = 9.5$ or $r + 12 = -9.5$

$-12 \quad -12 \qquad -12 \quad -12$

$r = -2.5 \qquad r = -21.5$

$a^2 - 8a + 39 = 0$

$-39 \quad -39$

$a^2 - 8a + 16 = -39 + 16$

$b = -8$

$c = \left(\frac{-8}{2}\right)^2 = 16$

$a^2 - 8a + 16 = -23$

$\sqrt{(a-4)^2} = \sqrt{-23}$

No solution

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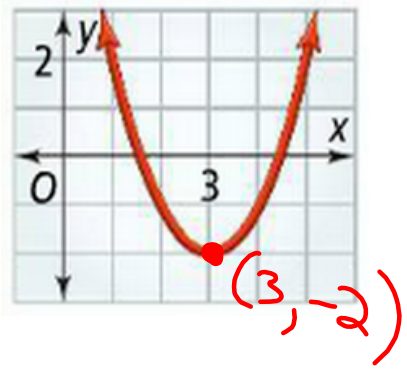
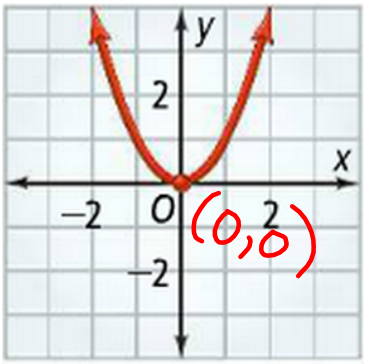
Review: Finding the vertex of a parabola

$y = x^2 - 6x + 7$





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The equation $y = (x - h)^2 + k$ represents a parabola with vertex (h, k). You can use the method of completing the square to find the vertex of quadratic functions of the form $y = x^2 + bx + c$.

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Find the vertex of each parabola by completing the square.

$y = x^2 + 10x + 20$

$b = 10$

$c = \left(\frac{10}{2}\right)^2 = 25$

$y = (x^2 + 10x + 25) - 5$

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

$(-5, -5)$

$y = x^2 + 4x - 16$

$b = 4$

$c = \left(\frac{4}{2}\right)^2 = 4$

$y = (x^2 + 4x + 4) - 20$

$y = (x + 2)^2 - 20$

$(-2, -20)$

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