March 25, 2024

Algebra 1

Our Goal: To learn to solve quadratic equations by completing the square

Warm Up: Quiz discussion

Today's Homework
9.4 Exercises, p.511: 12-32 (evens)

Previous Homework
iready, if needed

$h = -16t^2 + 44t + 5$

$35 = -16t^2 + 44t + 5$

$-35 \quad -35$

$0 = -16t^2 + 44t - 30$

$0 = -8t^2 + 22t - 15$

$0 = 8t^2 - 22t + 15$

(x) 120
(+) -22

$\sqrt{(2x+3)^2} = \sqrt{64}$

$2x + 3 = \pm 8$

$-3 \quad -3$

$\frac{2x}{2} = \frac{-3 \pm 8}{2}$

$x = \frac{-3 \pm 8}{2}$

$= \frac{-3+8}{2} \quad \frac{-3-8}{2}$

$= \frac{5}{2}$ OR $\frac{-11}{2}$

Solve.

a. $x^2 + 6x + 5 = 0$

$(x+5)(x+1)=0$

$-1, -5$

b. $x^2 + 6x + 4 = 0$

$\left(\frac{6}{2}\right)^2$

$x^2+6x=-4$

$x^2+6x+9=5$

$(x+3)^2=5$

$x+3=\pm\sqrt{5}$

$x=-3\pm\sqrt{5}$

Core Concept

Completing the Square

Words To complete the square for an expression of the form $x^2 + bx$, follow these steps.

Step 1 Find one-half of b, the coefficient of x.

Step 2 Square the result from Step 1.

Step 3 Add the result from Step 2 to $x^2 + bx$.

Factor the resulting expression as the square of a binomial.

Algebra $x^2 + bx + \left(\frac{b}{2}\right)^2 = \left(x + \frac{b}{2}\right)^2$

Complete the square for each expression. Then factor the trinomial.

a. $x^2 + 6x$

b. $x^2 - 9x$

$+\left(\frac{-9}{2}\right)^2$

$= \frac{81}{4}$

$x^2 - 9x + \frac{81}{4}$

$\left(x - \frac{9}{2}\right)^2$

Solve $x^2 - 16x = -15$ by completing the square.

Solve $2x^2 + 20x - 8 = 0$ by completing the square.

Solve $x^2 + 5x = 1$ by completing the square.

$x^2+5x+\left(\frac{5}{2}\right)^2 = 1+\frac{25}{4}$

$\sqrt{\left(x+\frac{5}{2}\right)^2} = \sqrt{\frac{29}{4}}$

$x+\frac{5}{2} = \pm\sqrt{\frac{29}{4}}$

$\frac{\sqrt{29}}{\sqrt{4}}$ $\sqrt{4}=2$

$x+\frac{5}{2} = \frac{\pm\sqrt{29}}{2}$

$x = -\frac{5}{2} \pm \frac{\sqrt{29}}{2}$ ✓

$x = \frac{-5 \pm \sqrt{29}}{2}$ ✓

Find the minimum value of $y = x^2 + 4x - 1$.

$y = (x^2 + 4x + (\frac{4}{2})^2) - 4 - 1$

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

$V = (-2, -5)$ $Min = -5$

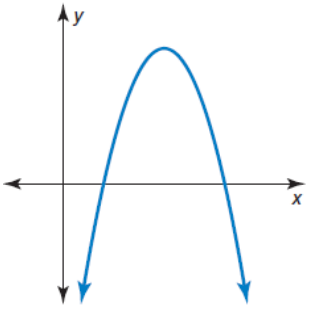
Find the maximum value of $y = -x^2 + 2x + 7$.

$y = -(x^2 - 2x + (\frac{-2}{2})^2) + 7 + 1$

$y = -(x-1)^2 + 8$

$Max = ?$

Which of the functions could be represented by the graph? Explain.



$f(x) = -\frac{1}{2}(x + 4)^2 + 8$

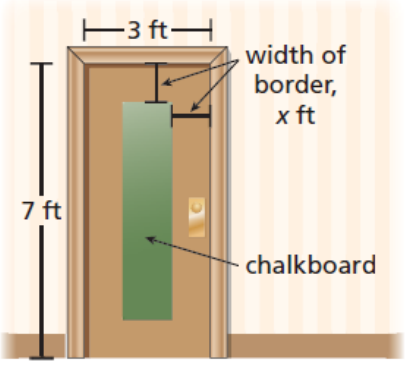
$g(x) = -(x - 5)^2 + 9$

$m(x) = (x - 3)(x - 12)$

$p(x) = -(x - 2)(x - 8)$

The function $y = -16x^2 + 96x$ represents the height y (in feet) of a model rocket x seconds after it is launched. (a) Find the maximum height of the rocket. (b) Find and interpret the axis of symmetry.

You decide to use chalkboard paint to create a chalkboard on a door. You want the chalkboard to cover 6 square feet and to have a uniform border, as shown. Find the width of the border to the nearest inch.



$x^2+8x+3=0$

$x^2+8x=-3$

$x^2+8x+\left(\frac{8}{2}\right)^2=-3$

$x^2+8x+16=13$

$(x+4)^2=13$

$x+4=\pm\sqrt{13}$

$x=-4\pm\sqrt{13}$

$x^2-10x=7$

$x^2-10x+\left(\frac{-10}{2}\right)^2=7$

$x^2-10x+25=7+25$

$(x-5)^2=32$

$x-5=\pm\sqrt{32}$

$x=5\pm\sqrt{32}$

$x=5\pm\sqrt{4}\sqrt{8}$

$x=5\pm2\sqrt{4}\sqrt{2}$

$x=5\pm2\cdot2\sqrt{2}$

$x=5\pm4\sqrt{2}$

$$\frac{2}{2}x^2+\frac{2}{2}x=\frac{3}{2}$$

$$x^2+x=\frac{3}{2}$$

$$x^2+x+\frac{1}{4}=\frac{3}{2}+\frac{1}{4}$$

$$\left(x+\frac{1}{2}\right)^2=\frac{7}{4}$$

$$x+\frac{1}{2}=\pm\sqrt{\frac{7}{4}}\qquad \frac{\sqrt{7}}{2}$$

$$x=-\frac{1}{2}\pm\frac{\sqrt{7}}{2}$$

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