11.7 Homework Solutions

Monday, November 30, 2015
7:25 PM

Practice for Lesson 11.7

Use the quadratic formula to solve the equation. If necessary, round answers to the nearest hundredth.

1. $n^2 + 8n + 15 = 0$
2. $6x^2 - 5x = 4$
3. $4t^2 - 8t + 1 = 0$
4. $-3(x^2 + 2x) + 4 = 0$

1.) $a=1$, $b=8$, $c=15$

$$x = \frac{-8 \pm \sqrt{(8)^2 - 4(1)(15)}}{2(1)} = \frac{-8 \pm \sqrt{124}}{2}$$

$$= \frac{-8 \pm 2\sqrt{31}}{2} = \boxed{-4 \pm \sqrt{31}}$$

2.) $6x^2 - 5x - 4 = 0$

$a=6$
$b=-5$
$c=-4$

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4(6)(-4)}}{2(6)} = \frac{5 \pm \sqrt{121}}{12} = \frac{5 \pm 11}{12}$$

+ case: $\frac{5+11}{12} = \frac{16}{12} = \frac{4}{3}$

− case: $\frac{5-11}{12} = \frac{-6}{12} = -\frac{1}{2}$

$\boxed{x = \frac{4}{3}, -\frac{1}{2}}$

3. $a=4$, $b=-8$, $c=1$

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(4)(1)}}{2(4)} = \frac{8 \pm \sqrt{48}}{8}$$

$\sqrt{48}$
$\sqrt{16} \cdot \sqrt{3}$
$4\sqrt{3}$

$$= \frac{8 \pm 4\sqrt{3}}{8} = \frac{2 \pm \sqrt{3}}{2} = \boxed{1 \pm \frac{\sqrt{3}}{2}}$$

4.) $-3x^2 - 6x + 4 = 0$

$a=-3$
$b=-6$
$c=4$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(-3)(4)}}{2(-3)} = \frac{6 \pm \sqrt{84}}{-6} = \frac{6 \pm 2\sqrt{21}}{-6} = \frac{3 \pm \sqrt{21}}{-3} = \boxed{-1 \pm \frac{\sqrt{21}}{3}}$$

For the equation, state the value of the discriminant. Then state the number of real roots for the equation. ← $b^2 - 4ac$

5. $4x^2 - 28x + 49 = 0$
6. $x^2 - 3x + 6 = 0$
7. $9x^2 - 12x - 1 = 0$
8. $4x^2 = 4x + 4$

5.) $a=4$, $b=-28$, $c=49$

$b^2 - 4ac$
$(-28)^2 - 4(4)(49)$
$\boxed{0}$

So..... 1 Real Root!

6.) $b^2 - 4ac = (-3)^2 - 4(1)(6) = -15$... no real roots!

7.) $b^2 - 4ac = (-12)^2 - 4(9)(-1) = 180$... 2 real roots.

8.) $4x^2 - 4x - 4 = 0 \Rightarrow b^2 - 4ac = (-4)^2 - 4(4)(-4) = 80$... 2 real roots

Use either factoring or the quadratic formula to solve the equation. Round to the nearest tenth if necessary.

9. $2t^2 - 12t + 16 = 0$
10. $3x^2 + 8x - 3 = 0$
11. $3r^2 + 10r = 7$

9.) $2(t^2 - 6t + 8) = 0$
$2(t-4)(t-2) = 0$
$t - 4 = 0$, $t - 2 = 0$
$\boxed{t = 2, 4}$

10.) $3x^2 + 8x - 3 = 0$ ← used guess + check
$(3x - 1)(x + 3) = 0$
$3x - 1 = 0$, $x + 3 = 0$
$\boxed{x = \frac{1}{3}, -3}$

11.) $3r^2 + 10r + 7 = 0$ ← used split the middle
$3r^2 + 7r + 3r + 7 = 0$
$r(3r + 7) + 1(3r + 7) = 0$
$(3r + 7)(r + 1) = 0$
$3r + 7 = 0$, $r + 1 = 0$

$\boxed{t = 2, 4}$

$\boxed{x = \frac{1}{3}, -3}$

$(3r+7)(r+1)=0$

$3r+7=0 \qquad r+1=0$

$\boxed{r = -7/3, -1}$

← USE QUAD. FORMULA!

12.) $2x^2+5x-9=0$

$$x = \frac{-5 \pm \sqrt{5^2-4(2)(-9)}}{2(2)} = \frac{-5 \pm \sqrt{169}}{4}$$

$$= \frac{-5 \pm 13}{4}$$

$+ \rightarrow \frac{-5+13}{4} = \frac{8}{4} = 2$

$- \rightarrow \frac{-5-13}{4} = \frac{-18}{4} = -\frac{9}{2}$

$\boxed{x = -\frac{9}{2}, 2}$

13. Without graphing, determine the x-intercepts of $y = x^2 - 6x - 16$.

14. A stone is thrown from a catapult. The function $h = -16t^2 + 80t$ describes the height h of the stone as a function of time t.

a. How high is the stone at 3.5 seconds?

b. Write a related equation in standard form that can be solved to find the times when the stone will be 84 feet above the ground.

c. Using any method you prefer, solve your equation to find the times that the stone is 84 feet above the ground. Round your answer to the nearest tenth, if necessary.

d. When will the stone be 36 feet high?

13.) Find when $y=0$!

$0 = x^2-6x-16$

$0 = (x-8)(x+2)$

$\boxed{x = 8, -2}$

14.) a.) let $t = 3.5$

$h = -16(3.5)^2 + 80(3.5) = \boxed{84 \text{ feet high}}$

b.) let $h = 84$

$84 = -16t^2 + 80t$ ← find intersection on calc

$\boxed{0 = -16t^2 + 80t - 84}$ ← find zeros on calc.

c.) solve for (b) ... put in calculator + find intersection.

$Y_1 = -16t^2 + 80t$

$Y_2 = 80$

$\boxed{t = 1.5 \text{ and } 3.5 \text{ sec.}}$

d.) let $h = 36$

$36 = -16t^2 + 80t$

$Y_1 = -16t^2 + 80t$
$Y_2 = 36$ } Put in calc + find intersection

$\boxed{t = 0.5 \text{ and } 4.5 \text{ sec}}$

Solve by

15. The main cable of a suspension bridge can be modeled by the function $h = 0.00234x^2 - 0.75x + 80$, where h represents the height of the cable above the roadway and x measures the horizontal distance across the bridge starting from the left tower.

At what positions will the vertical support cables be 50 feet long? ← let $h = 50$

15.) $50 = 0.00234x^2 - 0.75x + 80$ finding intersections

OR

$0 = 0.00234x^2 - 0.75x + 30$ Solve by finding zeros.

$\boxed{x = 47 \text{ or } 274 \text{ ft.}}$

16. The function $d = 0.08s^2 - 2s + 28$ can be used to model the braking distance (in feet) of a certain car traveling at a given speed s (in miles per hour).

a. What braking distance does this function predict for a speed of 27 miles per hour?

b. If the vehicle takes 64 feet to brake to a complete stop, what speed does the function predict?

16.) a.) Let $s = 27$. $d = 0.08(27)^2 - 2(27) + 28$
$\approx \boxed{32.3 \text{ ft.}}$

b.) Let $d = 64$
$64 = 0.08s^2 + 2s + 28$
$\boxed{37.1 \text{ mph}}$ *Neg. Answer does not make sense!

17. The quadratic formula $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ gives the x-intercepts of the points where the graph of the quadratic equation in standard form crosses the x-axis. Use this information and the fact that the x-coordinate of the vertex is midway between the two zeros to determine the x-coordinate of the vertex of the graph. (Hint: Consider the two x-intercepts, $x_1 = \dfrac{-b + \sqrt{b^2 - 4ac}}{2a}$ and $x_2 = \dfrac{-b - \sqrt{b^2 - 4ac}}{2a}$.)

17.) Find midpoint! $\left(\dfrac{x_1 + x_2}{2}\right)$

$$= \left(\frac{\frac{-b + \sqrt{b^2 - 4ac}}{2a} + \frac{-b - \sqrt{b^2 - 4ac}}{2a}}{2}\right) \qquad \frac{\frac{-b + \cancel{\sqrt{b^2 - 4ac}} - b - \cancel{\sqrt{b^2 - 4ac}}}{2a}}{2} = \frac{\left(\frac{-2b}{2a}\right)}{2} = \frac{\left(\frac{-b}{a}\right)}{2}$$

$$x = \boxed{\frac{-b}{2a}} \; :)$$

18. The quadratic formula can be derived by solving the general form of a quadratic equation. Copy the derivation below and supply the missing reasons.

Original equation	$ax^2 + bx + c = 0$
a. Subtract c	$ax^2 + bx = -c$
b. Divide by a	$\frac{ax^2}{a} + \frac{bx}{a} = -\frac{c}{a}$
Simplify.	$x^2 + \frac{b}{a}x = -\frac{c}{a}$
Complete the square.	$x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = \frac{b^2}{4a^2} - \frac{c}{a}$ ← The coefficient of x^2 is 1. So you can complete the square on the left side of the equation by adding the square of $\frac{1}{2} \cdot \frac{b}{a}$.
Factor the left side, and simplify the right side.	$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$
c. Take square root	$x + \frac{b}{2a} = \pm\sqrt{\frac{b^2 - 4ac}{4a^2}}$
d. Subtract $\frac{b}{2a}$	$x = -\frac{b}{2a} \pm \sqrt{\frac{b^2 - 4ac}{4a^2}}$
Simplify.	$x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$
Combine the fractions.	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$