

Directions: Please show all your work to receive credit. You will be graded on the clarity and organization of your work as well as its accuracy. All problems must be solved algebraically to receive credit. No credit will be given for guessing. You may **not** use a calculator on this test. Except for printing your name, do not write on this paper.

1. (12 points) Solve each of the following equations. Simplify all answers fully. No credit for guessing.

a. $(x + 357)^2 - 7 = 17$

b. $10 + x(x + 23) = 5(x + 2)$

2. (6 points) Solve the following inequality. Write your answer in set notation.

$$5 + 2 | x + 5 | \geq 17$$

3. (6 points) Let $f(x) = x^2 - 3x + 7$. Solve the equation $f(x) = f(5)$.

4. (6 points) The distance (in miles) of a car from Seattle t hours after 2:00 pm is given by the function

$$D(t) = | 40t - 110 | , \quad 0 \leq t \leq 7.$$

Find all times when the car is exactly 42 miles from Seattle. Answer with a sentence.

5. (6 points) A ball is thrown straight up with an initial speed of 60 ft/sec. The height of the ball (in feet) above the ground t seconds after being released is given by the function

$$h(t) = -16t^2 + 60t + 5.$$

When is the ball the same height as it was one second after being released?

6. (8 points) Assume that the relationship between the number of 12 oz. sodas the PUB sells in a day and the price is linear. Suppose that they will sell 180 sodas per day if they charge 80 cents for a soda, but they will only sell 120 sodas per day if they raise the price to \$1.00. Express the number of sodas sold q in terms of the price p in cents.

7. (4 points) Let $f(x) = \frac{2}{3}x - 4$. Solve the equation $f(x) = \frac{1}{2}$.

8. (2 points) Explain the meaning of $\sqrt{50}$. One sentence should be enough.

$$(x+357)^2 - 7 = 17$$

$$\sqrt{(x+357)^2} = \sqrt{24}$$

$$x+357 = \pm \sqrt{24}$$

$$x = -357 \pm \sqrt{24}$$

$$b) 10 + x(x+23) = 5(x+2)$$

$$10 + x^2 + 23x = 5x + 10$$

$$x^2 + 23x + 10 - 5x - 10 = 0$$

$$x^2 + 18x = 0$$

$$(x+18)(x+0) = 0$$

$$x+18=0 \quad \text{or} \quad x+0=0$$

$$x = -18$$

$$\text{or } x = 0$$

$$\{-18, 0\}$$

$$3. \text{ Let } f(x) = x^2 - 3x + 7$$

$$\text{Solve: } f(x) = f(5)$$

$$y = (5)^2 - 3(5) + 7$$

$$= 25 - 15 + 7$$

$$y = 17$$

$$17 = x^2 - 3x + 7$$

$$0 = x^2 - 3x - 10$$

$$0 = (x+2)(x-5)$$

$$x+2=0$$

$$\text{or } x-5=0$$

$$x = -2$$

$$\text{or}$$

$$x = 5$$

$$\{-2, 5\}$$

$$2. \quad 5 + 2|x+5| \geq 17$$

$$\begin{aligned} & -5 \qquad \qquad \qquad -5 \\ & \frac{2|x+5|}{2} \geq \frac{12}{2} \\ & |x+5| \geq 6 \end{aligned}$$

$$x+5 \geq 6 \quad \text{or} \quad x+5 \leq -6$$

$$x \geq 1 \quad \text{or} \quad x \leq -11$$

$$\{x \mid x \geq 1 \text{ or } x \leq -11\}$$

✓

4. distance of a car from Seattle in t hrs after 2:00pm

$$D(t) = |40t - 110|, \quad \begin{matrix} 2:00\text{pm} & 9:00\text{pm} \\ 0 \leq t \leq 7 \end{matrix}$$

✓

$$42 = 40t - 110$$

$$\text{or } -42 = 40t - 110$$

$$152 = \frac{40t}{40}$$

$$\frac{68}{40} = \frac{40t}{40}$$

$$\frac{19}{5} = t$$

$$\frac{17}{10} = t$$

3 hrs 48 min

1 hr 42 min

The car is exactly 42 miles from Seattle at 3:42 pm and 5:48 pm.

5. (in ft/sec)

$$h(t) = h(1)$$

$$h(t) = -16t^2 + 60t + 5$$

$$h(1) = -16(1)^2 + 60(1) + 5$$

$$= -16 + 60 + 5$$

$$h(1) = 49$$

$$49 = -16t^2 + 60t + 5$$

$$-49 = -16t^2 + 60t - 44$$

$$0 = -16t^2 + 60t - 44$$

$$0 = -4(4t^2 - 15t + 11)$$

$$0 = -4(4t - 11)(t - 1)$$

$$4t - 11 = 0 \quad \text{or} \quad t - 1 = 0$$

$$\frac{4t}{4} = \frac{11}{4} \quad \text{or} \quad t = 1$$

The ball is the same height as it is one second after being released $\frac{1}{4}$ seconds after it's released.

$$-4(4x - 11) = 0$$

$$-16x + 44 = 0$$

$$-16x = -44 \quad x = \frac{44}{16}$$

60s

$-\frac{16}{4}$

$$\rightarrow -(16t^2 - 60t + 44)$$

$$1 \cdot 11$$

$$(4x - 11)(x - 11)$$

$$(4x - 11)(x - 1)$$

$$4x^2 - 11 - 4x + 11$$

6. 180 sodas / day @ 80¢
 $q = \#$ of sodas sold
 y

120 sodas / day @ 11¢
 $p =$ price in cents
 x

$$(80, 180)$$

$$(100, 120)$$

$$\frac{120 - 180}{100 - 80} = -\frac{60}{20} = -\frac{3}{1}$$

$$y - y_1 = m(x - x_1)$$
$$q - q_1 = -\frac{3}{1}(p - p_1)$$

$$q - 180 = -3(p - 80)$$
$$q - 180 = -\frac{3}{1}p + 240$$
$$+180 \qquad +180$$

$$q = -3p + 420$$

7. let $f(x) = \frac{2}{3}x - 4$

Solve: $f(x) = \frac{1}{2}$

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

$$\frac{9}{2} = \frac{2}{3}x$$
$$\frac{27}{2} = x$$

$$\frac{9}{2} \times \frac{3}{2} = \frac{27}{4}$$

8. $\sqrt{50}$ = a positive or ~~negative~~ number multiplied by itself that equals 50.
(The square root of 50 is a positive or negative number multiplied by itself to equal 50.)