

Lesson 8.3.2

8-130. $(x \pm 1), (x \pm 2), (x \pm 3), (x \pm 6)$

- a. a: No. 5 is not a factor of 6, the constant term.
- b. $x - 2$ and $x + 1$
- c. Check by substitution or division
- d. $(x - 2)(x^3 + x^2 - 3x - 3)$ or $(x + 1)(x^3 - 2x^2 - 3x + 6)$
- e. $(x - 2)(x + 1)(x^2 - 3)$
- f. $-1, 2, \pm\sqrt{3}$

8-132. See below:

- a. $(x - 1)(x^2 + 4x + 5)$, roots: $1, -2 \pm i$
- b. $(x + 3)(x - 2)(2x + 1)(3x - 1)$, roots: $-3, 2, -\frac{1}{2}, \frac{1}{3}$
- c. $(x + 1)^2(x^2 + 9)$, roots: $-1, \pm i$
- d. $(x - 1)^3(x - 5)$, roots: $1, 5$
- e. $(x + 2)(x - 2)(x - 1)(x^2 + x + 1)$, roots: $-2, 2, 1, \frac{-1 \pm i\sqrt{3}}{2}$
- f. $(x + 1)(x^2 - 7)$, roots: $-1, \pm\sqrt{7}$

8-134. See below:

- a. $(x - 1)(x^2 + x + 1)$
- b. $(x + 2)(x^2 - 2x + 4)$
- c. $(x - 3)(x + 3x + 9)$
- d. $(x + 5)(x^2 - 5x + 25)$

8-135. See below:

- a. $(x + a)(x^2 - ax + a^2)$

b. $(x - b)(x^2 + bx + b^2)$

8-136. $x^4 - b^4$ can be factored as the difference of squares $(x^2 - b^2)(x^2 + b^2) = (x - b)(x + b)(x^2 + b^2)$, but $x^4 + a^4$ cannot be factored without using imaginary numbers.

8-137. There are many possibilities. See sample answers below.

a. 1 real zero $(x - 1)(x^2 + 2x + 8)$, 2 real zeros $(x - 1)^2(x + 2)$, 3 real zeros $(x - 1)(x - 2)(x - 3)$

b. 0 real zeros $(x^2 + 2x + 10)(x^2 + 4)$, 1 real zero $(x + 1)^2(x^2 + 2)$, 2 real zeros $(x - 2)(x - 3)(x^2 + 3)$, 3 real zeros $(x - 2)(x - 3)(x - 1)^2$, 4 real zeros $(x - 1)(x - 2)(x - 3)(x - 4)$

c. 1 real zero $(x - 3)(x^2 + 1)(x^2 + 2)$, 2 real zeros $(x - 3)(x - 2)^2(x^2 + 1)$, 3 real zeros $(x - 3)(x - 1)(x + 2)(x^2 + 1)$, 4 real zeros $(x - 1)(x - 2)^2(x - 3)(x + 1)$, 5 real zeros $(x - 1)(x - 2)(x - 3)(x - 4)(x - 5)$



8-138. See below:

a. It shows that $(x - 3)$ is a double factor and 3 is a double root.

b. $p(x) = (x - 3)^2(x^2 + 2x - 1)$, $-1 \pm \sqrt{2}$

8-139. See below:

a. $x^2 - 6x + 25 = 0$

b. $x^2 - 6x + 25 = 0$

c. Answers vary.

8-140. See below:

a. $\frac{3+2i}{-4+7i} \cdot \frac{-4-7i}{-4-7i} = \frac{2-29i}{65}$

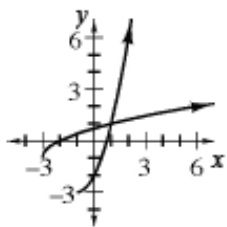
b. $\frac{2}{65} - \frac{29}{65}i$

8-141. See below:

a. $\frac{12}{5} - \frac{1}{5}i$

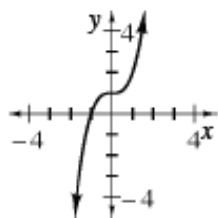
b. $-\frac{2}{13} + \frac{11}{13}i$

8-142. $\sqrt{x+3} - 1$; $x \geq -3$, $y \geq -1$

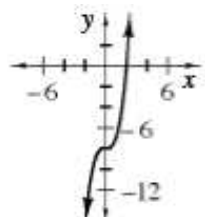


8-143. See below:

a. $-1, \frac{1 \pm \sqrt{3} i}{2}$



b. $2, -1 \pm \sqrt{3} i$



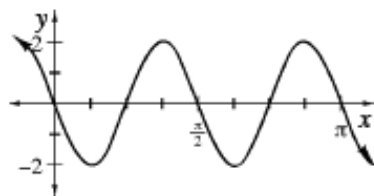
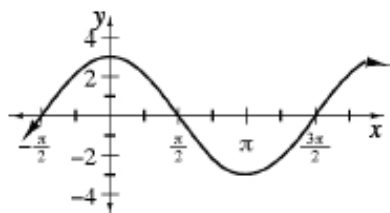
8-144. $(3, 4, -1)$

8-145. $x = \frac{1}{2}$

8-146. See below:

a. locator $\left(-\frac{\pi}{2}, 0\right)$,
period $= 2\pi$,
amplitude $= 3$

b. locator $(0, 0)$, period $= \frac{\pi}{2}$,
amplitude $= 2$,
inverted



8-147. $p(x) = x^3 + 5x^2 + 33x + 29$

8-148. See below:

a. $p(2) = 0$

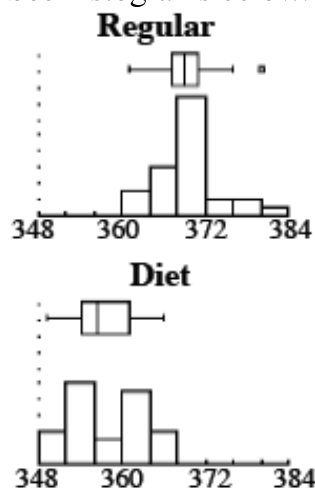
- b. $(x - 2)$
- c. $(x^2 - 4x - 1)$
- d. $2, 2 \pm \sqrt{5}$

8-149. See below:

- a. $\frac{8}{17} + \frac{15}{17}i$
- b. $2 + 5i$

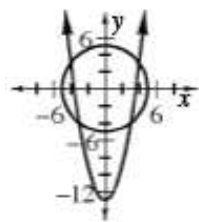
8-150. See below:

- a. Regular: (361, 367, 369, 373, 380 grams); Diet (349, 354, 356.5, 361, 366 grams)
- b. See histograms below.



- c. Regular: The mean is 369.6 grams, which falls at the middle of the distribution on the histogram. The shape is single-peaked and symmetric, so the mean should be a good measure of the center. There are no outliers, so the standard deviation of 4.34 grams could be used to describe spread.
Diet: The mean is 357.5 grams; this mean also falls at the center of the data on the histogram. The data is double-peaked but still fairly symmetric so the mean could be used to represent the center. There are no outliers so the standard deviation of 5.12 grams could be used to describe spread.
- d. The regular cola cans are noticeably heavier (or had more mass) than the diet cans. The lightest regular can is at the third quartile of the diet sample and the median of the regular cans is heavier than the most massive diet can. The spread of each distribution is similar and they are both reasonably symmetric but the diet cans have a double peaked distribution.
- e. Some answers include: Megan was weighing the can and the cola so the weight of the can is included in the data. Machines are out of adjustment or maybe not capable of filling the cans to the exact same amount each time. The regular cola weighs more than the diet because of all the sugar dissolved in it. Fluid ounces are actually a measure of volume not weight.

8-151. See graph below.



a. 4

b. $(\pm 4, 3)$ and $(\pm 3, -4)$

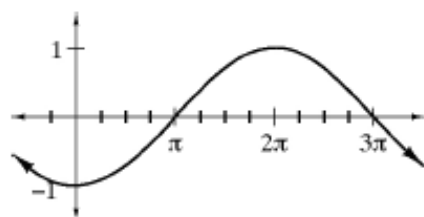
8-152. See below:

a. $x = 4$, (1 is extraneous)

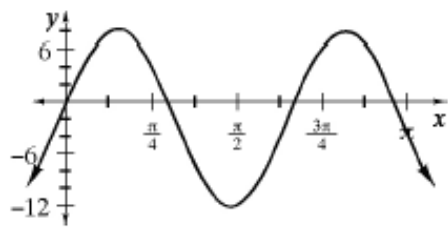
b. $x = \frac{1}{4}$

8-153. See graphs below:

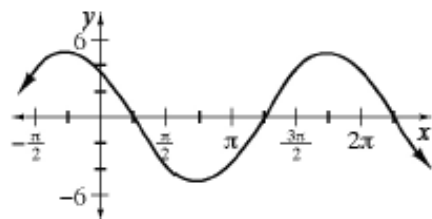
a.



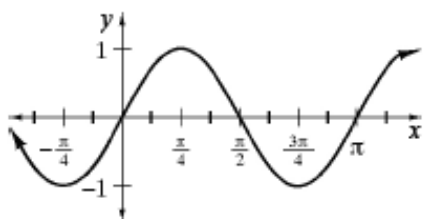
b.



c.



d.



8-154. See below:

- a. $x = 2, (x - 2)$
- b. $x = 2, -3 + 2i, -3 - 2i; (x - 2)(x - (-3 + 2i))(x - (-3 - 2i))$

8-155. See below:

- a. $x = \frac{2\pi}{3}, \frac{4\pi}{3}$
- b. $x = \frac{\pi}{6}, \frac{7\pi}{6}$
- c. $x = 0, \pi$
- d. $x = \frac{\pi}{4}, \frac{7\pi}{4}$

8-156. See below:

- a. $-\frac{1}{5} - \frac{7}{5}i$
- b. $1 - 2i$

8-157. At 6 years, it will be worth \$23,803.11. At 7 years it will be worth \$25,707.36.

8-158. See below:

- a. $x = \frac{5}{9}$
- b. $x = 3$
- c. $x = 48$
- d. $x \approx 1.46$

8-159. Students should show the substitution of the coordinates of the point into both equations to verify.

8-160. $x = 2$ or $x \approx 1.1187$

8-161. See below:

- a. $x \approx 781.36$
- b. $x = 6$
- c. $x = 1, \frac{1}{5}$
- d. $x = 0, 1, 2$

8-162. When you find the complement of the angle, the x and y values reverse.

8-163. See below:

- a. $\sqrt{-7} \cdot \sqrt{-7} = i\sqrt{7} \cdot i\sqrt{7} = i^2\sqrt{49} = -7$
- b. She multiplied $\sqrt{-7} \cdot \sqrt{-7}$ to get $\sqrt{49} = 7$
- c. $\sqrt{-7}$ is undefined in relation to real numbers, and is only defined as the imaginary number $\sqrt{7}i$, so it must be written in its imaginary form before operations such as addition or multiplication can be performed.
- d. a and b must be non-negative real numbers.

8-164. See below:

- a. $\frac{\pi}{3}$
- b. $\frac{5\pi}{12}$
- c. $\frac{7\pi}{6}$
- d. $\frac{5\pi}{4}$