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Homework 1

2.1: 4, 7, 9, 12, 14, 17, 26, 30, 32, 38, 40, 46

4. $\vec{RP}$

Given: $R(-3,7)$ and $P(-1,3)$

$$\vec{RP} = \langle -1-(-3), 3-7\rangle = \boxed{\text{a. } \langle 2,-4\rangle} = \boxed{\text{b. } 2\hat{\mathbf{i}} - 4\hat{\mathbf{j}}}$$

7. $2\vec{PQ} - 2\vec{PR}$

Given: $R(-3,7), P(-1,3),$ and $Q(1,5)$

$$2\vec{PQ} - 2\vec{PR} = 2\langle 1-(-1), 5-3\rangle - 2\langle -3-(-1), 7-3\rangle$$
$$= 2\langle 2,2\rangle - 2\langle -2,4\rangle = \langle 4,4\rangle - \langle -4,8\rangle =$$
$$= \boxed{\text{a. } \langle 8,-4\rangle} = \boxed{\text{b. } 8\hat{\mathbf{i}} - 4\hat{\mathbf{j}}}$$

9. The unit vector in the direction of $\vec{PQ}$

As found: $\vec{PQ} = \langle 2,2\rangle$

$$\text{UV of } \vec{PQ} = \frac{\langle 2,2\rangle}{||\vec{PQ}||}$$
$$\frac{\langle 2,2\rangle}{\sqrt{2^2+2^2}} = \frac{\langle 2,2\rangle}{2\sqrt{2}} = \left\langle \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right\rangle = \left\langle \frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2} \right\rangle = \boxed{\frac{\sqrt{2}}{2}\hat{\mathbf{i}} + \frac{\sqrt{2}}{2}\hat{\mathbf{j}}}$$

12. A vector $\mathbf{v}$ has initial point $(-2,5)$ and terminal point $(3,-1)$. Find the unit vector in the direction of $\mathbf{v}$. Express the answer in component form.

Given: $\vec{v} = \langle 3-(-2), -1-5\rangle = \langle 5,-6\rangle$

$$\text{UV of } \vec{v} = \frac{\vec{v}}{||\vec{v}||}$$
$$\frac{\langle 5,-6\rangle}{\sqrt{5^2+(-6)^2}} = \frac{\langle 5,-6\rangle}{\sqrt{25+36}} = \frac{\langle 5,-6\rangle}{\sqrt{61}} = \boxed{\left\langle \frac{5}{\sqrt{61}}, -\frac{6}{\sqrt{61}} \right\rangle}$$

14. The vector $\mathbf{v}$ has initial point $P(1,1)$ and terminal point Q that is on the x-axis and left of the initial point. Find the coordinates of terminal point Q such that the magnitude of the vector $\mathbf{v}$ is 10.

Given: $P(1,1), Q(q_x,0),$ and $||\vec{PQ}|| = 10$

Note that: $q_x < 1$

$$(q_x-1)^2 + (0-1)^2 = 10$$
$$(q_x-1)^2 + 1 = 10$$
$$(q_x-1)^2 = 9$$
$$q_x = \pm\sqrt{9} + 1$$
$$q_x = 1-3 = -2$$
$$\boxed{Q = (-2,0)}$$

17. Let a be a standard-position vector with terminal point $(-2,-4)$. Let b be a vector with initial point $(1,2)$ and terminal point $(-1,4)$. Find the magnitude of vector $-3a+b-4\hat{\mathbf{i}}+\hat{\mathbf{j}}$

$$\text{Given: } \vec{a}=\langle -2,-4\rangle\,;\ \vec{b}=\langle -1-1,4-2\rangle=\langle -2,2\rangle$$
$$-3\langle -2,-4\rangle+\langle -2,2\rangle-4\langle 1,0\rangle+\langle 0,1\rangle=\langle 6,12\rangle+\langle -2,2\rangle-\langle 4,0\rangle+\langle 0,1\rangle$$
$$=\langle 0,15\rangle\,;\quad ||\langle 0,15\rangle||=\boxed{15}$$

26.

30.

32.

38.

40.

46.

2.2: 61, 64, 66, 68, 72, 74, 76, 78, 84, 89, 92, 100, 103

61.

64.

66.

72.

74.

76.

78.

84.

89.

92.

100.

103.

2.3: 126, 130, 132, 136, 140, 142, 146, 148, 150, 152, 154, 168, 170, 172

126.

130.

132.

136.

140.

142.

146.

148.

150.

152.

154.

168.

170.

172.