

19.  $P = (0, 0), Q = (3, 4) \quad v = (3 - 0)i + (4 - 0)j = 3i + 4j$   
 20.  $P = (0, 0), Q = (-3, -5) \quad v = (-3 - 0)i + (-5 - 0)j = -3i - 5j$   
 21.  $P = (3, 2), Q = (5, 6) \quad v = (5 - 3)i + (6 - 2)j = 2i + 4j$   
 22.  $P = (-3, 2), Q = (6, 5) \quad v = (6 - (-3))i + (5 - 2)j = 9i + 3j$   
 23.  $P = (-2, -1), Q = (6, -2) \quad v = (6 - (-2))i + (-2 - (-1))j = 8i - j$   
 24.  $P = (-1, 4), Q = (6, 2) \quad v = (6 - (-1))i + (2 - 4)j = 7i - 2j$   
 25.  $P = (1, 0), Q = (0, 1) \quad v = (0 - 1)i + (1 - 0)j = -i + j$   
 26.  $P = (1, 1), Q = (2, 2) \quad v = (2 - 1)i + (2 - 1)j = i + j$

27. For  $v = 3i - 4j, \|v\| = \sqrt{3^2 + (-4)^2} = \sqrt{25} = 5$

28. For  $v = -5i + 12j, \|v\| = \sqrt{(-5)^2 + 12^2} = \sqrt{169} = 13$

29. For  $v = i - j, \|v\| = \sqrt{1^2 + (-1)^2} = \sqrt{2}$

30. For  $v = -i - j, \|v\| = \sqrt{(-1)^2 + (-1)^2} = \sqrt{2}$

31. For  $v = -2i + 3j, \|v\| = \sqrt{(-2)^2 + 3^2} = \sqrt{13}$

32. For  $v = 6i + 2j, \|v\| = \sqrt{6^2 + 2^2} = \sqrt{40} = 2\sqrt{10}$

33.  $v = 3i - 5j, w = -2i + 3j$   
 $2v + 3w = 2(3i - 5j) + 3(-2i + 3j) = 6i - 10j - 6i + 9j = -j$

34.  $v = 3i - 5j, w = -2i + 3j$

$$3v - 2w = 3(3i - 5j) - 2(-2i + 3j) = 9i - 15j + 4i - 6j = 13i - 21j$$

35.  $v = 3i - 5j, w = -2i + 3j$

$$\|v - w\| = \|(3i - 5j) - (-2i + 3j)\| = \|5i - 8j\| = \sqrt{5^2 + (-8)^2} = \sqrt{89}$$

36.  $v = 3i - 5j, w = -2i + 3j$

$$\|v + w\| = \|(3i - 5j) + (-2i + 3j)\| = \|i - 2j\| = \sqrt{1^2 + (-2)^2} = \sqrt{5}$$

37.  $v = 3i - 5j, w = -2i + 3j$

$$\|v\| - \|w\| = |3i - 5j| - |-2i + 3j| = \sqrt{3^2 + (-5)^2} - \sqrt{(-2)^2 + 3^2} = \sqrt{34} - \sqrt{13}$$

38.  $v = 3i - 5j, w = -2i + 3j$

$$\|v\| + \|w\| = |3i - 5j| + |-2i + 3j| = \sqrt{3^2 + (-5)^2} + \sqrt{(-2)^2 + 3^2} = \sqrt{34} + \sqrt{13}$$

39.  $u = \frac{v}{\|v\|} = \frac{5i}{\|5i\|} = \frac{5i}{\sqrt{25+0}} = \frac{5i}{5} = i$

40.  $u = \frac{v}{\|v\|} = \frac{-3j}{\|-3j\|} = \frac{-3j}{\sqrt{0+9}} = \frac{-3j}{3} = -j$

41.  $u = \frac{v}{\|v\|} = \frac{3i - 4j}{\|3i - 4j\|} = \frac{3i - 4j}{\sqrt{3^2 + (-4)^2}} = \frac{3i - 4j}{\sqrt{25}} = \frac{3i - 4j}{5} = \frac{3}{5}i - \frac{4}{5}j$

42.  $u = \frac{v}{\|v\|} = \frac{-5i + 12j}{\|-5i + 12j\|} = \frac{-5i + 12j}{\sqrt{(-5)^2 + 12^2}} = \frac{-5i + 12j}{\sqrt{169}} = \frac{-5i + 12j}{13} = -\frac{5}{13}i + \frac{12}{13}j$

43.  $u = \frac{v}{\|v\|} = \frac{i - j}{\|i - j\|} = \frac{i - j}{\sqrt{1^2 + (-1)^2}} = \frac{i - j}{\sqrt{2}} = \frac{1}{\sqrt{2}}i - \frac{1}{\sqrt{2}}j = \frac{\sqrt{2}}{2}i - \frac{\sqrt{2}}{2}j$

44.  $u = \frac{v}{\|v\|} = \frac{2i - j}{\|2i - j\|} = \frac{2i - j}{\sqrt{2^2 + (-1)^2}} = \frac{2i - j}{\sqrt{5}} = \frac{2}{\sqrt{5}}i - \frac{1}{\sqrt{5}}j = \frac{2\sqrt{5}}{5}i - \frac{\sqrt{5}}{5}j$