Trigonometry Test 3 Practice
Chapters 5 and 6

NON-CALCULATOR PORTION

Find four solutions to each of the following; write your answer in π radians:

1. $\sin^{-1}(-1)$
2. $\sin^{-1} 0$
3. $\sin^{-1} 1$
4. $\cos^{-1}(-1)$
5. $\cos^{-1} 0$
6. $\cos^{-1} 1$

Find the value of each of the following:

7. $\sin\left(\frac{-3\pi}{2}\right)$
8. $\sin \pi$
9. $\sin\left(\frac{3\pi}{2}\right)$
10. $\cos(-2\pi)$
11. $\cos 0$
12. $\cos \pi$
13. $\cos\left(\frac{3\pi}{2}\right)$

Find four solutions, in π radians, of each equation.

14. $\sin(3x + 2) = -1$
15. $\sin(3x + 2) = 0$
16. $\sin(3x + 2) = 1$
17. $\cos(\pi x + 5) = -1$
18. $\cos(\pi x + 5) = 0$
19. $\cos(\pi x + 5) = 1$
20. $6\sin(2x) + 9 = 3$
21. $6\cos(2x) - 9 = -3$

Find the exact value of the remaining trig functions.

22. $\cos x = \frac{-4}{9}$ and $\sin x > 0$

CALCULATOR PORTION

Find two solutions, rounded to four decimal places, for each equation.

23. $\sin x = 0.55$
24. $\cos x = 0.55$
25. $3\cos(5x) = -2$
26. $3\sin(5x) = -2$
27. $5\sin(\pi x + 5) + 6 = 7$
28. $5\cos(\pi x + 5) + 6 = 7$

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Chapters 5 and 6

Applications.

29. The current at a point in an electric circuit is $C(t) = 20\sin(30\pi t)$ for $t \geq 0$. Find the first time when the current is 15.

30. Suppose that a ladder that is 12 feet long leans against a house and the base of the ladder is 4 feet from the wall. What angle does the ladder make with the ground? Give the answer rounded to the nearest degree.

31. A ramp to provide wheelchair access to building is 20 feet long and it rises up to a doorway that is 2 feet above the ground. What angle does the ramp make with the ground? Give the answer rounded to the nearest degree.

32. A boat leaves a dock and travels 6 miles due east of the dock and then turns and travels 3 miles north. A boat captain wants to tell a friend at the dock how to travel directly to the boat. How far is the boat from the dock and what angle does the direct line from the dock to the boat make with the east direction?

33. The line with the equation $y = 5x$ makes what angle with the positive x-axis?

34. The line with the equation $y = -3x$ makes what angle with the positive x-axis?

35. Draw a right triangle and label the sides so that $\sin(\theta) = \frac{4}{7}$. What is the exact value of the angle θ? What is the $\cos\theta$?

36. What angle with the positive x-axis does the line from the origin to the point (3, 5) make? Give the exact value and the decimal approximation rounded to two decimal places.

37. What angle with the positive x-axis does the line from the origin to the point (−2, 7) make? Give the exact value and the decimal approximation rounded to two decimal places.

38. Find the measure in decimal degrees of a central angle subtended by a chord of length 112 ft in a circle of radius 72.8 ft.

39. Find the perimeter (to the nearest centimeter) of a regular heptagon (seven-sided figure) inscribed in a circle with radius 5 cm.

Solve the following triangles. Round answers to two decimal places.

40. $\propto = 58^{\circ},\ \gamma = 12^{\circ},$ and $a = 10\ cm$
41. $\propto = 26^{\circ},\ a = 4.1\ m,$ and $b = 6.7\ m$
42. $\propto = 48^{\circ},\ a = 36,$ and $c = 47$
43. $a = 14.6, b = 28.1,$ and $c = 29.7\ m$
44. $a = 7\ m, b = 24\ m,$ and $c = 25\ m$
45. $a = 27, b = 61,$ and $c = 49$

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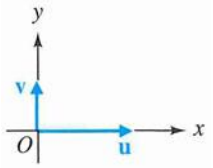
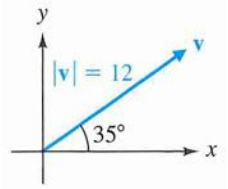
Chapters 5 and 6

Answer the following questions.

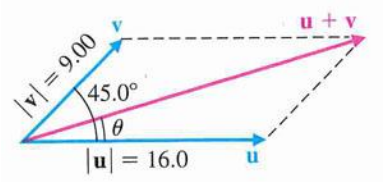
46. Two vectors **u** and **v** are located in a coordinate system, as indicated in the figure. Find the direction (relative to the *x* axis) and magnitude of **u** + **v** if $|\boldsymbol{u}| = 8.0$ and $|\boldsymbol{v}| = 5.0$.



47. Find the magnitude of the horizontal and vertical components of the vector **v** located in a coordinate system as indicated in the figure, then write **v** in terms of the unit vectors **i** and **j**.



48. Given $A = (-3,2) and\ B = (-1,-3)$ represent the geometric vector $\overrightarrow{AB}$ as an algebraic vector $\langle a, b\rangle$.
49. Find the magnitude of the vector $\langle -5,12\rangle$.
50. $\langle 2,-1\rangle \cdot \langle -3,2\rangle =$
51. $(2\boldsymbol{i} + \boldsymbol{j}) \cdot (3\boldsymbol{i} - 2\boldsymbol{j}) =$
52. For each pair of vectors, are they orthogonal, parallel, or neither?
    (A) $\langle 4,-3\rangle\ and\ \langle 8,6\rangle$ (B) $\langle \frac{5}{2}, \frac{-1}{2}\rangle\ and\ \langle -10,2\rangle$ (C) $\langle 10,-6\rangle\ and\ \langle 3,5\rangle$
53. Given the vector diagram, find $|\boldsymbol{u} + \boldsymbol{v}|\ and\ \theta$.



54. Find a unit vector **u** with the same direction as $\boldsymbol{v} = \langle -8,15\rangle$.
55. Express **v** in therms of **i** and **j** unit vectors.
    (A) $\boldsymbol{v} = \langle -5,7\rangle$ (B) $\boldsymbol{v} = \langle 0,-3\rangle$ (C) $\boldsymbol{v} = \overrightarrow{AB}; A = (4,-2); B = (0,-3)$
56. Determine which vector pairs are orthogonal using properties of the dot product.
    (A) $\boldsymbol{u} = \langle -12,3\rangle; \boldsymbol{v} = \langle 2,8\rangle$ (B) $\boldsymbol{u} = -4\boldsymbol{i} + \boldsymbol{j}; \boldsymbol{v} = -\boldsymbol{i} + 4\boldsymbol{j}$
57. Find $Comp_v\boldsymbol{u}$, the scalar component of **u** on **v**. Compute answers to three significant digits.
    (A) $\boldsymbol{u} = \langle 4,5\rangle; \boldsymbol{v} = \langle 3,1\rangle$ (B) $\boldsymbol{u} = -\boldsymbol{i} + 4\boldsymbol{j}; \boldsymbol{v} = 3\boldsymbol{i} - \boldsymbol{j}$

Applications.

58. An airplane files with a speed of 230km/hr and a compass heading of 68°. If a 55 km/hr wind is blowing in the direction of 5°, what is the plane's actual direction (relative to north) and ground speed?

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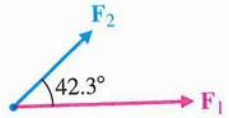
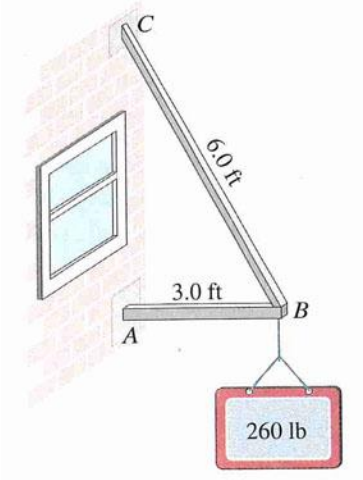
Chapters 5 and 6

59. Two forces act on an object as indicated in the figure:
$|\boldsymbol{F}_1| = 352\ lb;\ |\boldsymbol{F}_2| = 168\ lb$



Find the magnitude of the resultant force and its direction relative to the horizontal force $\boldsymbol{F}_1$.

60. A 260 lb sign is hung as shown in the figure. Determine the compression force on AB and the tension on CB.



For the following problems, find: (A) **u** + **v** (B) **u** – **v** (C) 3**u** – 2**v** (D) 2**u** – 3**v** + **w**

61. $\boldsymbol{u} = \langle 4,0\rangle; \boldsymbol{v} = \langle -2,-3\rangle; \boldsymbol{w} = \langle 1,-1\rangle$

62. $\boldsymbol{u} = 3\boldsymbol{i} - \boldsymbol{j}; \boldsymbol{v} = 2\boldsymbol{i} - 3\boldsymbol{j};\ \boldsymbol{w} = -2\boldsymbol{j}$

ANSWERS:

1. $\frac{-5\pi}{2}, \frac{-\pi}{2}, \frac{3\pi}{2}, \frac{7\pi}{2}$
2. $-\pi, 0, \pi, 2\pi$
3. $\frac{-7\pi}{2}, \frac{-3\pi}{2}, \frac{\pi}{2}, \frac{5\pi}{2}$
4. $-3\pi, -\pi, \pi, 3\pi$
5. $\frac{-3\pi}{2}, \frac{-\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}$
6. $-2\pi, 0, 2\pi, 4\pi$
7. 1
8. 0
9. –1
10. 1
11. 1

12. -1
13. 0
14. $x = \frac{-5\pi-4}{6}, x = \frac{-\pi-4}{6}, x = \frac{3\pi-4}{6}, x = \frac{7\pi-4}{6}$
15. $x = \frac{-\pi-2}{3}, x = \frac{-2}{3}, x = \frac{\pi-2}{3}, x = \frac{2\pi-2}{3}$
16. $x = \frac{-7\pi-4}{6}, x = \frac{-3\pi-4}{6}, x = \frac{\pi-4}{6}, x = \frac{5\pi-4}{6}$
17. $x = \frac{-3\pi-5}{\pi}, x = \frac{-\pi-5}{\pi}, x = \frac{\pi-5}{\pi}, x = \frac{3\pi-5}{\pi}$
18. $x = \frac{-3\pi-10}{2\pi}, x = \frac{-\pi-10}{2\pi}, x = \frac{\pi-10}{2\pi}, x = \frac{3\pi-10}{2\pi}$
19. $x = \frac{-2\pi-5}{\pi}, x = \frac{-5}{\pi}, x = \frac{2\pi-5}{\pi}, x = \frac{4\pi-5}{\pi}$
20. $x = \frac{-5\pi}{4}, \frac{-\pi}{4}, \frac{3\pi}{4}, \frac{7\pi}{4}$
21. $x = -\pi, 0, \pi, 2\pi$
22. $\sin x = \frac{\sqrt{65}}{9}, \tan x = \frac{-\sqrt{65}}{4}, csc\, x = \frac{9\sqrt{65}}{65}, sec\, x = \frac{-9}{4}, cot\, x = \frac{-4\sqrt{65}}{65}$
23. $x_1 = 0.5824,\ x_2 = 2.5592$
24. $x_1 = 0.9884,\ x_2 = 5.2948$
25. $x_1 = 0.4602,\ x_2 = 0.7965$
26. $x_1 = 0.7743,\ x_2 = 1.1107$
27. $x_1 = -1.5275,\ x_2 = -0.6556$
28. $x_1 = -1.1556,\ x_2 = -0.0275$
29. $x = 0.0090$
30. $\theta = 71^o$
31. $\theta = 6^o$
32. $d = 6.7\ miles, \theta = 27^o$
33. $\theta = 79^o$
34. $\theta = 108^o$
35. $\theta = \sin^{-1}\left(\frac{4}{7}\right), \cos\theta = \frac{\sqrt{33}}{7}$
36. $\theta = \tan^{-1}\left(\frac{5}{3}\right), \theta = 59.04^o$
37. $\theta = \tan^{-1}\left(\frac{-7}{2}\right), \theta = 105.95^o$

38. 100.57^{o}
39. 30 cm
40. $\beta = 110^{o}, b = 11.08$ cm, $c = 2.45\ cm$
41. $\beta = 45.75^{o}, y = 108.25^{o}, c = 8.88\ m$
    $\beta' = 134.25^{o}, y' = 19.75^{o}, c' = 3.16\ m$
42. $\gamma = 75.98^{o}, \beta = 56.02^{o}, b = 40.17$
    $\gamma' = 104.02^{o}, \beta' = 27.98^{o}, b' = 22.73$
43. $\propto = 29.09^{o}, \beta = 69.35°, \gamma = 81.56°$
44. $\propto = 16.26^{o}, \beta = 73.74^{o}, \gamma = 90^{o}$
45. $\propto = 25.56^{o}, \beta = 102.9^{o}, \gamma = 51.54^{o}$
46. 9.4 at 32°
47. $|\boldsymbol{H}| = 9.8;\ |\boldsymbol{V}| = 6.9; \boldsymbol{v} = 9.8\boldsymbol{i} + 6.9\boldsymbol{j}$
48. $\langle 2, -5 \rangle$
49. 13
50. -8
51. 4
52. (A) Neither (B) Parallel (C) Orthogonal
53. $|\boldsymbol{u} + \boldsymbol{v}| = 23.3;\ \theta = 15.9°$
54. $\boldsymbol{u} = \langle \frac{-8}{17}, \frac{15}{17} \rangle$
55. (A) $\boldsymbol{v} = -5\boldsymbol{i} + 7\boldsymbol{j}$ (B) $\boldsymbol{v} = -3\boldsymbol{j}$ (C) $\boldsymbol{v} = -4\boldsymbol{i} - \boldsymbol{j}$
56. (A) Orthogonal (B) Not Orthogonal
57. (A) $\frac{17}{\sqrt{10}} = 5.38$ (B) $\frac{-7}{\sqrt{10}} = -2.21$
58. 260 km/hr at 57°
59. Magnitude = 489 lb; Direction = 13.4°
60. Compression = 150 lb; Tension = 300 lb
61. (A) $\langle 2, -3 \rangle$ (B) $\langle 6,3 \rangle$ (C) $\langle 16,6 \rangle$ (D) $\langle 15,8 \rangle$
62. (A) 5**i** – 4**j** (B) **i** + 2**j** (C) 5**i** + 3**j** (D) 5**j**