

MATH 130 FINAL REVIEW

Problems 1 – 5 refer to triangle ABC, with $C=90^\circ$. Solve for the missing information.

1. $A = 40^\circ$, $c = 36m$
2. $B = 53^\circ 30'$, $b = 725mm$
3. $a = 91ft$, $b = 85ft$
4. $B = 21^\circ$, $c = 4.2ft$
5. $A = 66^\circ 54'$, $b = 28.28cm$

For problems 6 – 10, find the remaining trig functions of θ if:

6. $\sin \theta = \frac{12}{13}$ and θ terminates in QII.
7. $\cos \theta = \frac{7}{25}$ and θ terminates in QIV.
8. $\tan \theta = \frac{12}{5}$ and terminates in QI.
9. $\csc \theta = \frac{13}{5}$ and $\cos \theta < 0$
10. $\cos \theta = \frac{\sqrt{2}}{2}$ and terminates in QI

For problems 11 and 12, simplify after making the given substitution.

11. $\sqrt{x^2 + 1}$, $x = \tan \theta$
12. $\sqrt{25 - x^2}$, $x = 5 \sin \theta$

For 13-15, perform the operation and simplify. Write answer in terms of $\sin \theta$ and $\cos \theta$.

13. $\frac{\cos \theta}{\sin \theta} + \frac{\sin \theta}{\cos \theta}$

14. $\frac{1}{\cos \theta} - \cos \theta$

15. $(\cos \theta - 2)^2$

For problems 16 and 17, write in terms of $\sin \theta$ and $\cos \theta$ and simplify.

16. $\sec \theta \cot \theta$

17. $\csc \theta - \cot \theta \cos \theta$

For problems 18 and 19, give an angle between 0° and 360° coterminal with the given angle.

18. -135°

19. -300°

For problems 20 – 24, evaluate without using a calculator. Write your answers in radians.

20. $\arcsin\left(-\frac{\sqrt{3}}{2}\right)$

21. $\tan^{-1}(-\sqrt{3})$

22. $\cos\left(\cos^{-1}\frac{3}{5}\right)$

23. $\csc\left(\tan^{-1}\frac{3}{4}\right)$

24. $\cos^{-1}\left(\cos\frac{5\pi}{3}\right)$

For problems 25 and 26, θ is a central angle in a circle of radius r . Find the arc length s cut off by θ .

25. $\theta = 3$, $r = 2\text{in}$

26. $\theta = \frac{\pi}{3}$, $r = 12\text{cm}$

27. The minute hand of a clock is 1.2 cm long. How far does the tip of the minute hand travel in 40 minutes?

For problems 28 and 29, find the area of a sector formed by a central angle θ in a circle of radius r .

28. $\theta = \frac{2\pi}{5}$, $r = 3\text{m}$

29. $\theta = 15^\circ$, $r = 10\text{m}$

30. If the sector formed by central angle of 30° has an area of $\frac{\pi}{3}\text{cm}^2$, find the radius of the circle.

For problems 31-35, identify the amplitude, period, phase shift, and vertical shift, and sketch the graph.

31. $y = \cos\left(x - \frac{\pi}{2}\right)$

32. $y = -3 + 3\sin\left(\frac{\pi}{3}x - \frac{\pi}{3}\right)$

33. $y = \tan\left(2x - \frac{\pi}{2}\right)$

34. $y = \frac{1}{2}\cos\left(3x - \frac{\pi}{2}\right)$

35. $y = \csc\left(x - \frac{\pi}{4}\right)$

For problems 36-41, let $\sin A = -\frac{3}{5}$ with $\frac{3\pi}{2} \leq A < 2\pi$ and $\sin B = \frac{12}{13}$ with $\frac{\pi}{2} \leq B \leq \pi$.

Evaluate each of the following.

36. $\sin(A+B)$

37. $\cos(A-B)$

38. $\cos 2B$

39. $\sin 2B$

40. $\sin \frac{A}{2}$

41. $\cos \frac{A}{2}$

For problems 42 – 45, find exact values.

42. $\sin 75^\circ$

43. $\cos 15^\circ$

44. $\tan \frac{\pi}{12}$

45. $\cos 67.5^\circ$

For problems 46 – 50, find all solutions in the interval $0^\circ \leq \theta < 360^\circ$. If necessary, round to the nearest tenth of a degree.

46. $2\sin \theta - 1 = 0$

47. $2\cos \theta - 2\sec \theta = 0$

48. $\sin \theta + \cos \theta = 1$

49. $\sin(3\theta - 45^\circ) = -\frac{\sqrt{3}}{2}$

50. $\tan 2\theta = 1$

For problems 51 – 54, find all solutions. Write your answer in radians using exact values.

51. $\cos 2x - 3\cos x = -2$

52. $\sqrt{3}\sin x - \cos x = 0$

53. $\sin 2x \cos x + \cos 2x \sin x = -1$

54. $\sin^3 4x = 1$

For problems 55 – 60, refer to triangle ABC, which is not necessarily a right triangle.

55. If $B = 118^\circ$, $C = 37^\circ$, and $c = 2.9\text{in.}$, find b .

56. If $C = 60^\circ$, $a = 10\text{cm}$, and $b = 12\text{cm}$, find c .

57. Find two triangles for which $A = 51^\circ$, $a = 6.5\text{ft}$, and $b = 7.9\text{ft}$.

58. Find two triangles for which $A = 26^\circ$, $a = 4.8\text{ft}$, and $b = 9.4\text{ft}$

59. Find all missing parts if $a = 6.4\text{m}$, $b = 2.8\text{m}$, and $C = 119^\circ$

60. Find all missing parts if $b = 3.7\text{m}$, $c = 6.2\text{m}$, and $A = 35^\circ$

For problems 61 – 64, refer to triangle ABC. In each case, find the area of the triangle. Round the answer to the nearest hundredth.

61. $a = 10\text{cm}$, $b = 12\text{cm}$, $C = 120^\circ$

62. $B = 57^\circ$, $C = 31^\circ$, $a = 7.3\text{m}$

63. $B = 14^\circ 20'$, $C = 75^\circ 40'$, $b = 2.72\text{ft}$.

64. $a = 8.32\text{ft}$, $b = 6.23\text{ft}$, $c = 3.45\text{ft}$

65. Combine: $(7 + 3i) + [(4 - 2i) - (3 + i)]$

66. Simplify: i^{17}

67. Multiply: $(3 + 5i)^2$

68. Divide: $\frac{6 + 5i}{6 - 5i}$

For problems 69 and 70, write the answer in standard form:

69. $8(\cos 330^\circ + i \sin 330^\circ)$

70. $2cis135^\circ$

For problems 71 and 72, write the answer in trigonometric form.

71. $2 + 2i$

72. $-\sqrt{3} + i$

For problems 73 – 76, multiply or divide as indicated. Leave answers in trigonometric form.

73. $5(\cos 25^\circ + i \sin 25^\circ) \cdot 3(\cos 40^\circ + i \sin 40^\circ)$

74. $\frac{10(\cos 50^\circ + i \sin 50^\circ)}{2(\cos 20^\circ + i \sin 20^\circ)}$

75. $[2(\cos 10^\circ + i \sin 10^\circ)]^5$

76. $[3cis20^\circ]^4$

For problems 77 – 80, use DeMoivre’s Theorem. Write the answer in standard form.

77. $[4(\cos 15^\circ + i \sin 15^\circ)]^3$

78. $(3cis30^\circ)^4$

79. $(1+i)^5$

80. $(-1+i)^8$

81. Find two square roots of $z = 49(\cos 50^\circ + i \sin 50^\circ)$. Leave your answers in trigonometric form.

82. Find 4 fourth roots of $z = 2 + 2i\sqrt{3}$. Leave your answers in trigonometric form.

83. If the angle of elevation of the sun is $75^\circ 30'$, how tall is a post that casts a shadow 1.5 feet long?

84. A boat leaves the harbor entrance and travels 25 miles in the direction $N 42^\circ E$. The captain then turns the boat 90° and travels another 18 miles in the direction $S 48^\circ E$. At that time, how far is the boat from the harbor entrance, and what is the bearing of the boat from the harbor entrance?

For problems 85 and 86, find the magnitude and direction of the vector.

85. $\langle -5, 6 \rangle$

86. $W = i + 2j$

For problems 87 and 88, find the components of the vector.

87. $|V| = 13.8, \theta = 24.2^\circ$

88. $|V| = 64, \theta = 0^\circ$

MATH 130 FINAL REVIEW ANSWER KEY

1. $B = 50^\circ$, $a = 23m$, $b = 28m$

2. $A = 36^\circ 30'$, $a = 536mm$, $c = 902mm$

3. $A = 47^\circ$, $B = 43^\circ$, $c = 125ft$

4. $A = 69^\circ$, $a = 3.9ft$, $b = 1.5ft$

5. $B = 23^\circ 06'$, $a = 66.30cm$, $c = 72.08cm$

6. $\cos \theta = -\frac{5}{13}$, $\tan \theta = -\frac{12}{5}$, $\csc \theta = \frac{13}{12}$, $\sec \theta = -\frac{13}{5}$, $\cot \theta = -\frac{5}{12}$

7. $\sin \theta = -\frac{24}{25}$, $\tan \theta = -\frac{24}{7}$, $\csc \theta = -\frac{25}{24}$, $\sec \theta = \frac{25}{7}$, $\cot = -\frac{7}{24}$

8. $\sin \theta = \frac{12}{13}$, $\cos \theta = \frac{5}{13}$, $\csc \theta = \frac{13}{12}$, $\sec \theta = \frac{13}{5}$, $\cot \theta = \frac{5}{12}$

9. $\sin \theta = \frac{5}{13}$, $\cos \theta = -\frac{12}{13}$, $\tan \theta = -\frac{5}{12}$, $\sec \theta = -\frac{13}{12}$, $\cot \theta = -\frac{12}{5}$

10. $\sin \theta = \frac{\sqrt{2}}{2}$, $\tan \theta = 1$, $\csc \theta = \sqrt{2}$, $\sec \theta = \sqrt{2}$, $\cot \theta = 1$

11. $|\sec \theta|$

12. $5|\cos \theta|$

13. $\frac{1}{\sin \theta \cos \theta}$

14. $\frac{\sin^2 \theta}{\cos \theta}$

15. $\cos^2 \theta - 4 \cos \theta + 4$

16. $\frac{1}{\sin \theta}$

17. $\sin \theta$

18. 225°

19. 60°

20. $-\frac{\pi}{3}$

21. $-\frac{\pi}{3}$

22. $\frac{3}{5}$

23. $\frac{5}{3}$

24. $\frac{\pi}{3}$

25. 6 in.

26. 4π cm

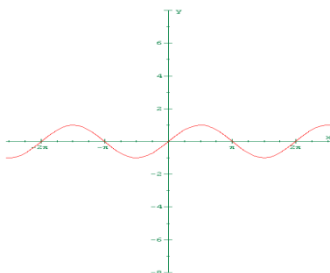
27. 5.03 cm or 1.6π cm

28. $\frac{9\pi}{5} m^2$

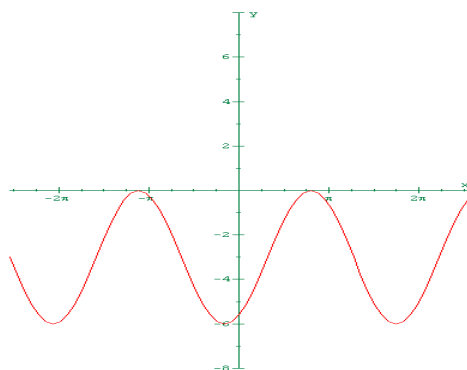
29. $\frac{25\pi}{6} m^2$

30. 2 cm

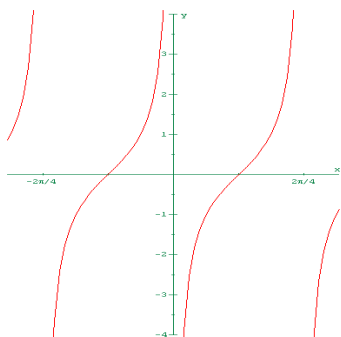
31. Amplitude = 1, Period = 2π , Phase shift = $\frac{\pi}{2}$



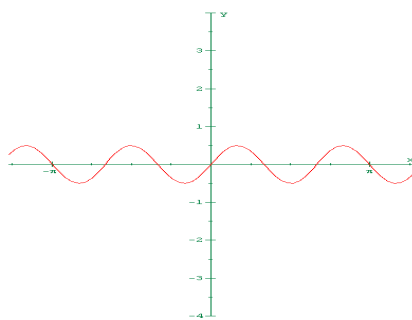
32. Amplitude = 3, Period = 6, Phase Shift = 1, Vertical shift = -3



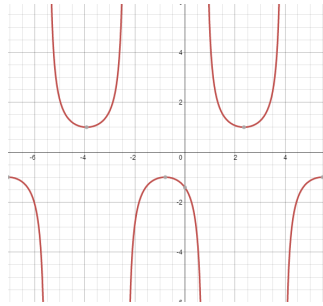
33. Period = $\frac{\pi}{2}$, Phase shift = $\frac{\pi}{4}$



34. Amplitude = $\frac{1}{2}$, Period = $\frac{2\pi}{3}$, Phase shift = $\frac{\pi}{6}$



35. Amplitude = 1, Period = 2, Phase shift = $\frac{1}{2}$



36. $\frac{63}{65}$

37. $-\frac{56}{65}$

38. $-\frac{119}{169}$

39. $-\frac{120}{169}$

40. $\frac{\sqrt{10}}{10}$

41. $-\frac{3\sqrt{10}}{10}$

42. $\frac{\sqrt{6} + \sqrt{2}}{4}$

43. $\frac{\sqrt{2} + \sqrt{6}}{4}$

44. $2 - \sqrt{3}$

45. $\frac{\sqrt{2 - \sqrt{2}}}{2}$

46. $30^\circ, 150^\circ$

47. $0^\circ, 180^\circ$

48. $0^\circ, 90^\circ$

49. $95^\circ, 115^\circ, 215^\circ, 235^\circ, 335^\circ, 355^\circ$

50. $22.5^\circ, 112.5^\circ, 202.5^\circ, 292.5^\circ$

51. $2\pi k, \frac{\pi}{3} + 2\pi k, \frac{5\pi}{3} + 2\pi k$

52. $\frac{\pi}{6} + 2\pi k, \frac{7\pi}{6} + 2\pi k$

53. $\frac{\pi}{2} + \frac{2\pi}{3}k$

54. $\frac{\pi}{8} + \frac{\pi}{2}k$

55. 4.3 in.

56. 11.1 cm

57. $B = 71^\circ, C = 58^\circ, c = 7.1\text{ft}, B' = 109^\circ, C' = 20^\circ, c' = 2.9\text{ft}$

58. $B = 59^\circ, C = 95^\circ, c = 11\text{ft}, B' = 121^\circ, C' = 33^\circ, c' = 6.0\text{ft}$

59. $A = 44^\circ, B = 17^\circ, c = 8.1\text{m}$

60. $B = 34^\circ, C = 111^\circ, a = 3.8\text{m}$

61. 51.96 cm^2

62. 11.47 m^2

63. 14.48 ft^2

64. 9.70 ft^2

65. 8

66. I

67. $-16 + 30i$

87. $|V_x| = 12.6, |V_y| = 5.66$

68. $\frac{11}{61} + \frac{60}{61}i$

88. $|V_x| = 64, |V_y| = 0$

69. $4\sqrt{3} - 4i$

70. $-\sqrt{2} + i\sqrt{2}$

71. $2\sqrt{2}(\cos 45^\circ + i \sin 45^\circ)$

72. $2(\cos 150^\circ + i \sin 150^\circ)$

73. $15(\cos 65^\circ + i \sin 65^\circ)$

74. $5(\cos 30^\circ + i \sin 30^\circ)$

75. $32(\cos 50^\circ + i \sin 50^\circ)$

76. $81cis80^\circ$

77. $32\sqrt{2} + 32i\sqrt{2}$

78. $-\frac{81}{2} + \frac{81\sqrt{3}}{2}i$

79. $-4 - 4i$

80. 16

81. $7cis25^\circ, 7cis205^\circ$

82. $\sqrt{2}cis15^\circ, \sqrt{2}cis105^\circ, \sqrt{2}cis195^\circ, \sqrt{2}cis285^\circ$

83. 5.8 ft.

84. 31 miles, bearing N 77.8° E

85. $\sqrt{17}$

86. $|W| = \sqrt{5}$