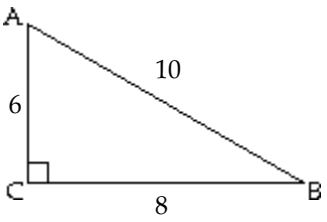
Find the exact values of the indicated trigonometric functions. Write fractions in lowest terms.

1)



Find sin A and cos A.

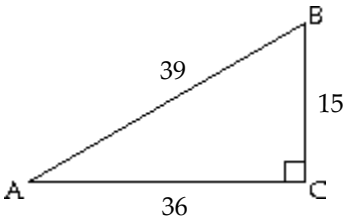
A) $\sin A = \frac{3}{5}; \cos A = \frac{4}{5}$

B) $\sin A = \frac{4}{5}; \cos A = \frac{3}{5}$

C) $\sin A = \frac{5}{4}; \cos A = \frac{5}{3}$

D) $\sin A = \frac{4}{3}; \cos A = \frac{3}{4}$

2)



Find tan A and cot A.

A) $\tan A = \frac{12}{5}; \cot A = \frac{5}{12}$

B) $\tan A = \frac{5}{12}; \cot A = \frac{12}{5}$

C) $\tan A = \frac{5}{13}; \cot A = \frac{12}{13}$

D) $\tan A = \frac{13}{5}; \cot A = \frac{13}{12}$

Find the requested function value of θ.

3) If $\sin \theta = \frac{8}{15}$, find $\sec \theta$.

A) $\frac{\sqrt{161}}{8}$ B) $\frac{15\sqrt{161}}{161}$

C) $\frac{\sqrt{161}}{15}$ D) $\frac{8\sqrt{161}}{161}$

4) If $\csc \theta = \frac{11}{7}$, find $\cot \theta$.

A) $\frac{11}{72}$ B) $\frac{\sqrt{72}}{11}$

C) $\frac{7}{72}$ D) $\frac{\sqrt{72}}{7}$

Solve.

5) A fire is sighted due west of lookout A. At lookout B, 14.2 miles due south of A, the fire is also sighted. The angle at B is 30.3°. How far is the fire from B (to the nearest tenth of a mile)?

A) 18.4 mi B) 16.4 mi

C) 17.4 mi D) 19.4 mi

Express the angle in degrees to the nearest hundredth.

6) 15°12'

A) 15.20 B) 15.26

C) 15.21 D) 15.16

Convert the angle measures to degrees, minutes, and seconds. Round seconds to whole units.

7) 43.39°

A) 43°23'30'' B) 43°23'12''

C) 43°23'24'' D) 43°23'39''

Write in terms of the cofunction.

8) sin 41°

A) tan 49° B) cot 49°

C) cos 41° D) cos 49°

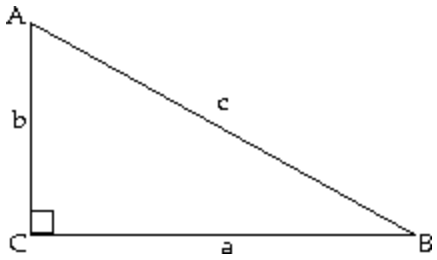
9) cot 31°

A) tan 149° B) cot 59°

C) tan 31° D) tan 59°

Solve the right triangle for all missing sides and angles to the nearest tenth.

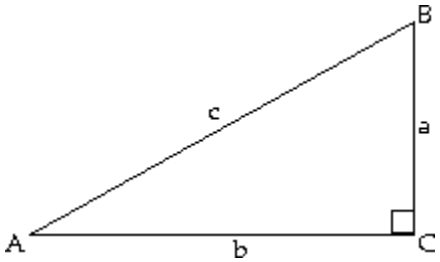
10)



c = 23
B = 32°

A) A = 58°, a = 19.5, b = 12.2
B) A = 58°, a = 12.2, b = 19.5
C) A = 58°, a = 19.5, b = 14.4
D) A = 58°, a = 14.4, b = 12.2

Solve the right triangle.



11) a = 18.2, b = 22.8

A) A = 38.6, B = 51.4, c = 13.7
B) A = 38.6, B = 51.4, c = 29.2
C) A = 51.4, B = 38.6, c = 29.2
D) A = 37, B = 53, c = 13.7

Solve.

12) A blimp is 1100 meters high in the air and measures the angles of depression to two stadiums to the west of the blimp. If those measurements are 75.2° and 17.9°, how far apart are the two stadiums to the nearest meter?

A) 3696 m B) 3150 m
C) 2441m D) 3115 m

13) What is the angle of elevation of the sun when a 60–ft flag pole casts a 21–ft shadow? Round to the nearest tenth of a degree.

A) 19.3° B) 70.7°
C) 69.5° D) 20.5°

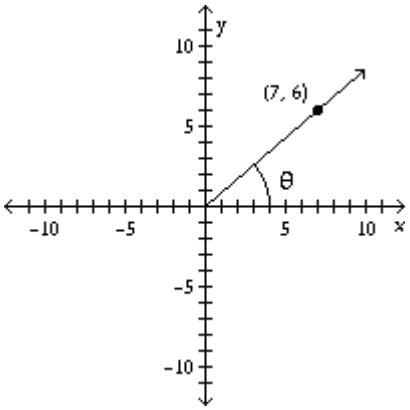
Find the trigonometric function value of angle A.

14) Given that the terminal side of A passes through (2, 1), find sin A.

A) $\frac{2}{1}$ B) $\frac{1\sqrt{5}}{5}$
C) $\frac{1}{2}$ D) $\frac{\sqrt{5}}{1}$

Find the trigonometric function value for the angle shown.

15) sec θ



A) sec θ = $\frac{7\sqrt{85}}{85}$ B) sec θ = $\frac{\sqrt{85}}{7}$
C) sec θ = $\frac{7}{6}$ D) sec θ = $\frac{6}{7}$

Find the trigonometric function value of angle A.

16) cos A = $\frac{2}{7}$ and A in quadrant IV

Find sin A.

A) $-\frac{7}{2}$ B) $-\frac{\sqrt{45}}{2}$
C) $-\sqrt{45}$ D) $-\frac{\sqrt{45}}{7}$

17) csc A = $-\frac{11}{5}$ and A in quadrant III

Find cot A.

A) $-\frac{5\sqrt{6}}{24}$ B) $\frac{4\sqrt{6}}{5}$
C) $-\frac{11\sqrt{6}}{24}$ D) $-\frac{4\sqrt{6}}{11}$

Find the measures of two angles, one positive and one negative, that are coterminal with the given angle.

18) 36°

A) 216°; –144° B) 126°; –54°

C) 396°; –324° D) 396°; –144°

Solve.

19) Find the complement of an angle whose measure is 24.52°.

A) 65.48° B) 155.48°

C) 114.52° D) 24.52°

20) Find the supplement of an angle whose measure is 25.13°.

A) 205.13° B) 115.13°

C) 154.87° D) 64.87°

Find the supplement or complement.

21) Supplement of $\frac{\pi}{12}$

A) $\frac{\pi}{4}$ B) $\frac{5\pi}{12}$

C) $\frac{7\pi}{12}$ D) $\frac{11\pi}{12}$

22) Complement of $\frac{\pi}{8}$

A) $\frac{7\pi}{8}$ B) $\frac{5\pi}{12}$ C) $\frac{3\pi}{8}$ D) $\frac{\pi}{8}$

Convert to radian measure. Leave your answer in terms of π.

23) –88.3°

A) $\frac{181.7}{180}\pi$ B) $\frac{271.7}{180}\pi$

C) $\frac{1.7}{180}\pi$ D) $\frac{91.7}{180}\pi$

Convert to radian measure. Round to two decimal places.

24) –201.3°

A) –3.52 B) –3.53

C) –3.50 D) –3.51

Convert to degree measure. Round to two decimal places, if necessary.

25) $\frac{32}{9}\pi$

A) 320° B) 11.16°

C) 1280π° D) 640°

26) 1

A) 114.60° B) 114.20°

C) 57.70° D) 57.30°

Solve.

27) A bicycle wheel rotates 51 times in 1 minute. Through how many degrees does a point on the tip of the wheel move in 7 seconds?

A) 42° B) 357°

C) 306° D) 2142°

28) In a circle with a 15–ft radius, how long is an arc associated with an angle of 0.5 radians?

A) 14.5 ft B) 7.5 ft

C) 15.5 ft D) 30 ft

Find the amplitude, period or phase shift.

29) Find the amplitude of $y = 2\cos(4x + \frac{\pi}{2})$.

A) 2 B) 8 C) 4 D) $\frac{\pi}{2}$

30) Find the period of $y = 3\cos(3x + \frac{\pi}{2})$.

A) $\frac{2\pi}{3}$ B) π C) 3 D) $\frac{\pi}{2}$

31) Find the phase shift of $y = -2 + 2\sin(6x - \frac{\pi}{2})$.

A) $\frac{\pi}{4}$ to the right B) $\frac{\pi}{12}$ to the left

C) $\frac{\pi}{2}$ to the left D) $\frac{\pi}{12}$ to the right

Multiply and simplify.

32) $(\cos x - \sin x)^2$

A) $\cos^2 x + 2\sin^2 x$

B) 1

C) $1 - 2\sin x \cos x$

D) $\cos^2 x + 2\sin x - \sin^2 x$

Factor and simplify.

33) $1 - 2\sin^2 x + \sin^4 x$

A) $\sin^2 x$ B) $(1 + \tan^2 x)$

C) $(1 - \sin^2 x)$ D) $\cos^4 x$

34) $\dfrac{\sin^2 x - 1}{\sin x + 1}$

A) $\sin x$ B) $\sin x - 1$

C) $\cos^2 x$ D) $\sin x + 1$

Simplify the expression.

35) $\dfrac{24\cos^3 x \sin x}{6\sin^2 x \cos x}$

A) $4\cos x \tan x$ B) $4\cos x \cot x$

C) $\dfrac{1}{4}\sin x \cot x$ D) $\dfrac{1}{4}\cos x \cot x$

Evaluate exactly.

36) $\cos \dfrac{5\pi}{12}$

A) $\sqrt{2}(\sqrt{3} - 1)$ B) $\dfrac{\sqrt{2}(\sqrt{3} - 1)}{4}$

C) $-\sqrt{2}(\sqrt{3} - 1)$ D) $-\dfrac{\sqrt{2}(\sqrt{3} - 1)}{4}$

37) If $\cos\theta = \dfrac{12}{13}$ and $\cos\phi = \dfrac{4}{5}$, find $\cos(\theta + \phi)$.

A) $\dfrac{63}{65}$ B) $\dfrac{56}{65}$ C) $\dfrac{33}{65}$ D) $\dfrac{16}{65}$

Solve.

38) Given that $\sin\theta = \dfrac{3}{5}$ and that the terminal side is in quadrant II, find $\cot\theta$ and $\csc\theta$.

A) $\cot\theta = -\dfrac{3}{4}$ and $\csc\theta = -\dfrac{5}{4}$

B) $\cot\theta = -\dfrac{4}{3}$ and $\csc\theta = \dfrac{5}{3}$

C) $\cot\theta = -\dfrac{4}{3}$ and $\csc\theta = -\dfrac{5}{4}$

D) $\cot\theta = -\dfrac{3}{4}$ and $\csc\theta = \dfrac{5}{3}$

Find the exact value.

39) Given that $\sin A = -4/5$ with A in quadrant IV, find $\sin 2A$.

A) $\dfrac{7}{25}$ B) $-\dfrac{7}{25}$

C) $\dfrac{24}{25}$ D) $-\dfrac{24}{25}$

Solve.

40) Find an equivalent expression for $\cos 3x$ in terms of powers of $\cos x$.

A) $2\cos^3 x + 3\cos x$

B) $4\cos^2 x - 3\cos x$

C) $9\cos x$

D) $4\cos^3 x - 3\cos x$

Simplify. Check your result using a grapher.

41) $1 - 2\sin^2 \dfrac{x}{2}$

A) $\sin x$ B) $\sin 2x$

C) $\cos 2x$ D) $\cos x$

Evaluate.

42) $\csc(\sin^{-1}\dfrac{3}{5})$

A) $\dfrac{4}{3}$ B) $\dfrac{5}{3}$ C) $\dfrac{3}{4}$ D) $\dfrac{3}{5}$

43) $\sin(\arctan 2)$

A) $2\sqrt{5}$ B) $5\sqrt{2}/2$

C) $2\sqrt{5}/5$ D) $5\sqrt{2}$

Find.

44) $\cos\left(\arctan\dfrac{a}{2}\right)$

A) $\dfrac{1}{\sqrt{a^2 + 4}}$ B) $\dfrac{2}{\sqrt{a^2 + 4}}$

C) $\dfrac{a}{\sqrt{a^2 + 4}}$ D) $\dfrac{2}{\sqrt{a^2 - 4}}$

Solve, finding all solutions.

45) $\sin x = \frac{\sqrt{3}}{2}$ (Express your answer in radians.)

A) $\frac{\pi}{3} + 2k\pi$, where k is any integer

B) $\frac{\pi}{3} + 2k\pi$ and $\frac{2\pi}{3} + 2k\pi$, where k is any integer

C) $\frac{\pi}{6} + 2k\pi$ and $\frac{5\pi}{6} + 2k\pi$, where k is any integer

D) $\frac{\pi}{6} + 2k\pi$ and $-\frac{\pi}{6} + 2k\pi$, where k is any integer

Solve, finding all solutions in $[0, 2\pi)$.

46) $\sin x = 1 - 2\sin^2 x$

A) No solution

B) $x = \frac{\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}$

C) $x = \frac{\pi}{6}, \frac{3\pi}{6}, \frac{5\pi}{2}$

D) $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$

Solve.

47) A generator produces an alternating current according to the equation $I = 48 \sin 135\pi t$, where t is time in seconds and I is the current in amperes. What is the smallest time t such that I = 24?

A) $\frac{1}{405}$ sec

B) $\frac{1}{810}$ sec

C) $\frac{1}{540}$ sec

D) $\frac{1}{270}$ sec

Solve the triangle, if possible.

48) B = 20.9°
C = 107.9°
b = 18.96

A) A = 49.2°, a = 50.58, c = 41.42

B) A = 51.2°, a = 43.42, c = 52.58

C) A = 49.2°, a = 52.58, c = 43.42

D) A = 51.2°, a = 41.42, c = 50.58

49) B = 18.5°
b = 14.38
a = 22.66

A) No solution

B) A = 30°, C = 131.5°, c = 33.94

C) A = 150°, C = 11.5°, c = 9.04

D) A = 30°, C = 131.5°, c = 33.94;
A' = 150°, C' = 11.5°, c' = 9.04

Find the area of triangle ABC.

50) A = 34.5°
b = 13.2 in.
c = 5.3 in.

A) 20 in^2

B) 31 in^2

C) 18 in^2

D) 29 in^2

Solve.

51) To find the distance AB across a river, a distance BC of 491 m is laid off on one side of the river. It is found that B = 106.6° and C = 12.5°. Find AB.

A) 122 m

B) 104 m

C) 125 m

D) 107 m

Solve the triangle, if possible.

52) a = 7.1
b = 13.3
c = 15.2

A) A = 29.84°, B = 59.02°, C = 91.14°

B) A = 27.84°, B = 61.02°, C = 91.14°

C) A = 25.84°, B = 61.02°, C = 93.14°

D) No solution

53) C = 113.5°
a = 6.80
b = 8.20

A) c = 18.4, A = 27.7°, B = 38.8°

B) c = 12.6, A = 29.7°, B = 36.8°

C) c = 15.5, A = 31.7°, B = 34.8°

D) No solution

Solve.

54) Two points, A and B, are on opposite sides of a building. A surveyor chooses a third point, C, 67 yd from B and 100 yd from A, with angle ACB measuring 64.5°. How far apart are A and B (to the nearest yard)?

A) 102 yd B) 111 yd

C) 93 yd D) 120 yd

55) Three ships, A, B, and C, are anchored in the ocean. The distance from A to B is 25.5 km, from B to C is 17.2 km, and from C to A is 37.4 km. Find the angle measurements of the triangle formed by the three ships.

A) A = 58.9°; B = 13.2°; C = 107.9°

B) A = 23.2°; B = 121.1°; C = 35.7°

C) A = 58.9°; B = 97.9°, C = 13.2°

D) A = 23.2°; B = 65.7°; C = 91.1°

Find the absolute value of the complex number.

56) 6 + 5i

A) 3.32 B) 7.81

C) 25 D) 4.69

Express the complex number in trigonometric form.

57) 4 – 4i

A) $4\sqrt{2}\left(\cos\frac{5\pi}{4}+i\sin\frac{5\pi}{4}\right)$

B) $4\sqrt{2}\left(\cos\frac{7\pi}{4}+i\sin\frac{7\pi}{4}\right)$

C) $4\left(\cos\frac{5\pi}{4}+i\sin\frac{5\pi}{4}\right)$

D) $4\left(\cos\frac{7\pi}{4}+i\sin\frac{7\pi}{4}\right)$

58) $-5\sqrt{3}-5i$

A) $10\left(\cos\frac{13\pi}{6}+i\sin\frac{13\pi}{6}\right)$

B) $5\sqrt{3}\left(\cos\frac{4\pi}{3}+i\sin\frac{4\pi}{3}\right)$

C) $5\sqrt{3}\left(\cos\frac{13\pi}{6}+i\sin\frac{13\pi}{6}\right)$

D) $10\left(\cos\frac{4\pi}{3}+i\sin\frac{4\pi}{3}\right)$

Express in standard notation.

59) 8(cos 30° + i sin 30°)

A) $\frac{1}{4}+\frac{\sqrt{3}}{4}i$ B) $\frac{\sqrt{3}}{4}+\frac{1}{4}i$

C) $4\sqrt{3}+4i$ D) $4+4\sqrt{3}i$

Find standard notation a + bi.

60) $3\left(\cos\frac{\pi}{6}+i\sin\frac{\pi}{6}\right)$

A) $\frac{\sqrt{3}}{2}+\frac{1}{2}i$ B) $\frac{3\sqrt{3}}{2}+\frac{3}{2}i$

C) $\frac{3}{2}+\frac{3\sqrt{3}}{2}i$ D) $\frac{1}{2}+\frac{\sqrt{3}}{2}i$

Multiply or Divide and leave the answer in trigonometric notation.

61) $2\left(\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}\right)\cdot 5\left(\cos\frac{\pi}{2}+i\sin\frac{\pi}{2}\right)$

A) $7\left(\cos\left(\frac{5\pi}{6}\right)+i\sin\left(\frac{5\pi}{6}\right)\right)$

B) $10\left(\cos\left(\frac{5\pi}{6}\right)+i\sin\left(\frac{5\pi}{6}\right)\right)$

C) $10\left(\cos\left(\frac{\pi}{6}\right)+i\sin\left(\frac{\pi}{6}\right)\right)$

D) $7\left(\cos\left(\frac{\pi}{6}\right)+i\sin\left(\frac{\pi}{6}\right)\right)$

62) $\dfrac{\frac{1}{6}\left(\cos\frac{5\pi}{4}+i\sin\frac{5\pi}{4}\right)}{\frac{1}{7}\left(\cos\frac{\pi}{6}+i\sin\frac{\pi}{6}\right)}$

A) $\frac{7}{6}\left(\cos\frac{13\pi}{12}+i\sin\frac{13\pi}{12}\right)$

B) $\frac{7}{6}\left(\cos\frac{15}{2}+i\sin\frac{15}{2}\right)$

C) $\frac{6}{7}\left(\cos\left(-\frac{13\pi}{12}\right)+i\sin\left(-\frac{13\pi}{12}\right)\right)$

D) $\frac{1}{42}\left(\cos\left(\frac{17\pi}{12}\right)+i\sin\left(\frac{17\pi}{12}\right)\right)$

Convert to trigonometric notation and perform the indicated operation.

63) $\dfrac{1+i}{\sqrt{3}+i}$

A) $\cos 75^\circ + i \sin 75^\circ$

B) $(\sqrt{2}-2)(\cos 15^\circ + i \sin 15^\circ)$

C) $\dfrac{\sqrt{2}}{2}(\cos 15^\circ + i \sin 15^\circ)$

D) $\dfrac{\sqrt{2}}{2}(\cos 75^\circ + i \sin 75^\circ)$

Raise the number to the indicated power and express in trigonometric notation.

64) $(5+5i)^2$

A) $50(\cos 45.00^\circ - i \sin 45.00^\circ)$

B) $50(\cos 45.00^\circ + i \sin 45.00^\circ)$

C) $50(\cos 90.00^\circ + i \sin 90.00^\circ)$

D) $50(\cos 90.00^\circ - i \sin 90.00^\circ)$

65) $\left[3\left(\cos \dfrac{7}{4}\pi + i \sin \dfrac{7}{4}\pi\right)\right]^4$

A) $81\left(4\cos \dfrac{7}{4}\pi + i\, 4\sin \dfrac{7}{4}\pi\right)$

B) $3\left(\cos \dfrac{7}{16}\pi + i \sin \dfrac{7}{16}\pi\right)$

C) $3\left(\cos \dfrac{7}{4}\pi + i \sin \dfrac{7}{4}\pi\right)$

D) $81\left(\cos 7\pi + i \sin 7\pi\right)$

Raise the number to the given power and write standard notation for the result.

66) $\left(-5\sqrt{2}+5\sqrt{2}i\right)^3$

A) $50\sqrt{2}+50\sqrt{2}i$ B) $5\sqrt{2}+5\sqrt{2}i$

C) $15\sqrt{2}+15\sqrt{2}i$ D) $500\sqrt{2}+500\sqrt{2}i$

67) $(4(\cos 120^\circ + i \sin 120^\circ))^5$

A) $-886.81 - 512i$ B) $-2 - 3.46i$

C) $-3.46 - 2i$ D) $-512 - 886.81i$

Find the indicated roots.

68) Cube roots of $8i$

A) $2i, \sqrt{3} - i, -\sqrt{3} - i$

B) $-2i, \sqrt{3} + i, -\sqrt{3} + i$

C) $2i, \sqrt{3} + i, -\sqrt{3} + i$

D) $-2i, -\sqrt{3} - i, \sqrt{3} - i$

69) Square roots of $-1 + \sqrt{3}i$

A) $6 - 2i, -6 - 2i$

B) $\sqrt{2}/2 + \sqrt{6}i/2, -\sqrt{2}/2 - \sqrt{6}i/2$

C) $\sqrt{6} + \sqrt{2}i, -\sqrt{6} - \sqrt{2}i$

D) $\sqrt{2}/2 - \sqrt{6}i/2, -\sqrt{2}/2 + \sqrt{6}i/2$

Find all solutions.

70) $z^2 - i = 0$

A) $\sqrt{2}/2 + \sqrt{2}i/2, -\sqrt{2}/2 - \sqrt{2}i/2$

B) $-i, i$

C) $-1, 1$

D) $\sqrt{2}/2 - \sqrt{2}i/2, -\sqrt{2}/2 + \sqrt{2}i/2$

Prove the identity.

71) $\dfrac{\sin\theta}{1+\cos\theta} + \dfrac{1+\cos\theta}{\sin\theta} = 2\csc\theta$

72) $\tan x + \cot x = 2 \csc 2x$

Determine whether the equation is an identity. If it is an identity, prove it.

73) $\cos x \csc x \tan x = 1$

1) B
2) B
3) B
4) D
5) B
6) A
7) C
8) D
9) D
10) A
11) B
12) D
13) B
14) B
15) B
16) D
17) B
18) C
19) A
20) C
21) D
22) C
23) B
24) D
25) D
26) D
27) D
28) B
29) A
30) A
31) D
32) C
33) D
34) B
35) B
36) B
37) C
38) B
39) D
40) D
41) D
42) B
43) C
44) B
45) B
46) D
47) B
48) D
49) D
50) A
51) A
52) B
53) B
54) C
55) B
56) B
57) B
58) A
59) C
60) B
61) B
62) A
63) C
64) C
65) D
66) D
67) D
68) B
69) B
70) A
71) $\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}=\frac{\sin^2\theta+(1+\cos\theta)^2}{(1+\cos\theta)(\sin\theta)}=$ $\frac{\sin^2\theta+1+2\cos\theta+\cos^2\theta}{(1+\cos\theta)(\sin\theta)}=\frac{2(1+\cos\theta)}{(1+\cos\theta)(\sin\theta)}=2\csc\theta.$
72) $\frac{\sin x}{\cos x}+\frac{\cos x}{\sin x}=\frac{\sin^2 x+\cos^2 x}{\sin x\cos x}=\frac{1}{\sin x\cos x}=$ $\frac{2}{2\sin x\cos x}=\frac{2}{\sin 2x}=2\csc 2x.$
73) The statement is an identity. The student's answer should include a proof.