Trigonometry Final Exam Review Problems Brewer

1. Given that $\cos\theta = \frac{-5}{13}$ and θ is in quadrant III, find the other five trig functions.

2. Find the length of an arc that subtends an angle of $120°$ on a circle whose diameter is 12 cm.

3. A wheel with a 18-in diameter is rotating at a rate of 7 radians per second. What is the linear speed of a point on its rim in feet per minute?

4. Graph $y = -3\sec\left(2x + \frac{3\pi}{2}\right) - 1$ using transformations.

5. Graph $y = \frac{1}{2}\tan\left(\frac{1}{3}x - \frac{\pi}{4}\right) + \frac{3}{2}$ using transformations.

6. Given that $\sin x = \frac{-3}{5}$ and x is in quadrant IV, find sin 2x, cos 2x, and tan 2x.

7. Evaluate $\tan\frac{7\pi}{12}$ using the half-angle identity.

8. Prove the identity. $\frac{\sin 2x}{\sin x} - \frac{\cos 2x}{\cos x} = \sec x$

9. Prove the identity. $\frac{\sin x - \cos x}{\cos^2 x} = \frac{\tan^2 x - 1}{\sin x + \cos x}$

10. Prove the identity. $\sin 3x + \sin x = 4\sin x - 4\sin^3 x$

11. Find all solutions (in radians) in the interval $0 \le x < 2\pi$. $2\cos^3 x = \cos x$

12. Find all solutions (in radians) in the interval $0 \le x < 2\pi$. $2\sin^2 2x = 1 - \cos 2x$

13. Solve the triangle. Round answers to the nearest tenth. $A = 24°, b = 13, a = 8$

14. Solve the triangle. Round answers to the nearest tenth. $a = 9, b = 13, c = 10$

15. A triangular swimming pool measures 44 ft on one side and 32.8 feet on another side. These sides form an angle that measures $40.8°$. How long is the other side?

16. Find the area of the triangle. $A = 113°, b = 18.2\ cm, c = 23.7\ cm$

17. John wants to measure the height of a tree. He walks exactly 100 feet from the base of the tree and looks up. The angle from the ground to the top of the tree is 33°. This particular tree grows at an angle of 83° with respect to the ground (leaning toward John) rather than vertically (90°). What is the length of the tree?

18. Given a vector with initial pt $(4, 2)$ and terminal pt $(-3, -3)$, find an equivalent vector whose initial pt is $(0, 0)$.

19. Given the vector $\vec{v} = \langle 6, -10\rangle$,
   a. Find the magnitude of the vector. Give an exact answer.
   b. Find the direction angle of the vector. Round to the nearest tenth of a degree.
   c. Find a unit vector in the direction of $\vec{v}$. Give an exact, rationalized answer.

20. Given $\vec{u} = 3\vec{\imath} - 2\vec{\jmath}$ and $\vec{v} = -2\vec{\imath} + 3\vec{\jmath}$, calculate $\vec{u} \cdot \vec{v}$.

21. Find the horizontal (a) and vertical (b) components of the vector with magnitude 4 and direction angle $127°$. Round to the nearest tenth, and write the vector in terms of $\vec{\imath}$ and $\vec{\jmath}$.

22. An airplane travels with an airspeed of 350 miles per hour at a heading of $200°$. The wind is blowing from the west at a speed of 16 miles per hour. Find the ground speed of the plane to the nearest tenth of a mile per hour.

23. A 40-pound object rests on a ramp that is inclined $12°$. Find the magnitude of the normal component of the force to the nearest tenth of a pound.

24. Find the angle between the two vectors $\vec{v} = \langle 5, -2 \rangle$ and $\vec{w} = \langle 2, 5 \rangle$ to the nearest tenth of a degree.

25. Write the complex number in trigonometric form. $z = 1 - i$

26. Divide the complex numbers in trigonometric form. Write the answer in standard form. $\frac{32\ cis\ 30°}{4\ cis\ 150°}$

$z_1 z_2 = r_1 r_2(\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2))$

$\frac{z_1}{z_2} = \frac{r_1}{r_2}(\cos(\theta_1 - \theta_2) + i\sin(\theta_1 - \theta_2))$

$\sin^2 x + \cos^2 x = 1$,

$1 + \cot^2 x = \csc^2 x$,

$\tan^2 x + 1 = \sec^2 x$

$\sin(a+b) = \sin a\cos b + \cos a\sin b$

$\sin(a-b) = \sin a\cos b - \cos a\sin b$

$\cos(a+b) = \cos a\cos b - \sin a\sin b$

$\cos(a-b) = \cos a\cos b + \sin a\sin b$

$\tan(a+b) = \frac{\tan a + \tan b}{1 - \tan a\tan b}$

$\tan(a-b) = \frac{\tan a - \tan b}{1 + \tan a\tan b}$

$\sin 2x = 2\sin x\cos x$

$\cos 2x = \cos^2 x - \sin^2 x$

$\cos 2x = 2\cos^2 x - 1$

$\cos 2x = 1 - 2\sin^2 x$

$\tan 2x = \frac{2\tan x}{1 - \tan^2 x}$

$\sin\frac{x}{2} = \pm\sqrt{\frac{1-\cos x}{2}}$

$\cos\frac{x}{2} = \pm\sqrt{\frac{1+\cos x}{2}}$

$\tan\frac{x}{2} = \pm\sqrt{\frac{1-\cos x}{1+\cos x}}$

$\tan\frac{x}{2} = \frac{\sin x}{1+\cos x}$

$\tan\frac{x}{2} = \frac{1-\cos x}{\sin x}$

$\frac{\sin A}{a} = \frac{\sin B}{b}$

$a^2 = b^2 + c^2 - 2bc\cos A$

$K = \frac{1}{2}bc\sin A$

$s = r\theta$, $v = \frac{s}{t}$

$\omega = \frac{\theta}{t}$, $v = r\omega$

$|\vec{v}| = \sqrt{a^2 + b^2}$

$\theta = \left|\tan^{-1}\frac{b}{a}\right|$

$a = |\vec{v}|\cos\theta$

$b = |\vec{v}|\sin\theta$

$\vec{u} = \frac{\vec{v}}{|\vec{v}|}$

$\vec{v}\cdot\vec{w} = a_1 a_2 + b_1 b_2$

$\theta = \cos^{-1}\frac{\vec{u}\cdot\vec{v}}{|\vec{u}||\vec{v}|}$

$\frac{5280\, ft}{1\, mi}$

$\frac{2\pi}{1\, rev}$