

1. Simplify the following trigonometric expressions: (3 pts each)

a. $\frac{\cot(-\theta)}{\csc(-\theta)}$

b. $\frac{2\sin^2 t + \sin t - 3}{1 - \cos^2 t - \sin t}$

2. If $\sin \alpha = \frac{2}{3}$ and $\sin \beta = \frac{1}{3}$ and α and β are between 0 and $\frac{\pi}{2}$. (3 pts each)

a. Evaluate $\sin(\alpha + \beta)$

b. Which quadrant does $(\alpha + \beta)$ lie in? JUSTIFY YOUR ANSWER!!!!

3. Find the partial fraction decomposition of the following: (4 pts each)

a. $\frac{-x^2+2x-13}{(x^2+2)(x-1)}$

b. $\frac{9}{(x+2)^2(x-1)}$

4. Solve the following equations: (2 pts each)

a. $\log(x^2 - 1) - \log(x - 1) = 1$

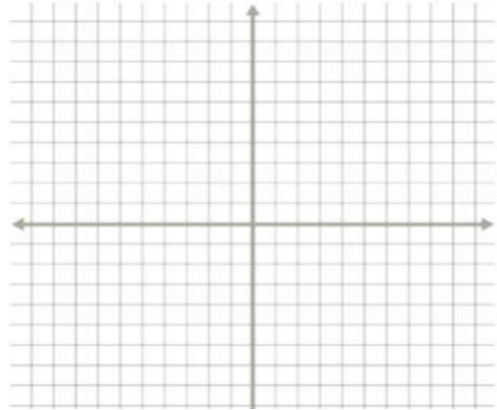
b. $3^{1-x} = 9^{2x}$

5. Expand the following logarithm: (2 pts)

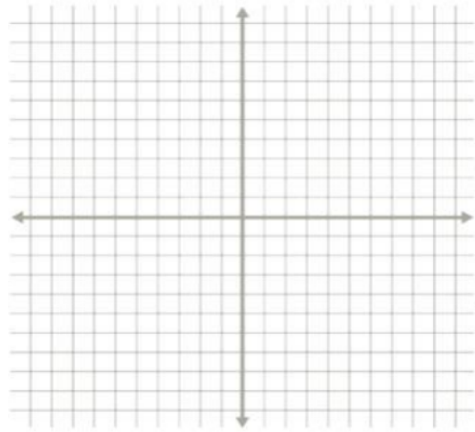
a. $\ln \sqrt[3]{\frac{y^3 z^2}{x^4}}$

6. Graph the following: (4 pts each)

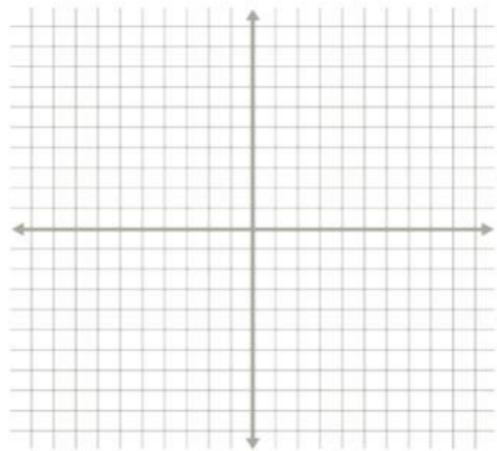
a. $1 - e^{-2x}$



b. $-\log_3(x + 1)$



c. $4x^2 + y^2 + 24x - 2y + 21 = 0$



7. Find $\sin(\theta)$, $\cos(\theta)$, and $\tan(\theta)$ for each of the following: (3 pts each)

a. $\theta = 1305^\circ$

b. $\theta = -780^\circ$

8. Two pulleys, 50cm and 30cm in diameter respectively, are connected by a belt. The larger pulley makes 12 revolutions per minute. Find the angular speed of the smaller pulley in radians *per second*. (5 pts)

9. Solve the following system of equations: (5 pts)

$$\begin{aligned}2x - y + 4z &= -3 \\x - 2y - 10z &= -6 \\3x + 4z &= 7\end{aligned}$$

10. For $A = \begin{bmatrix} -1 & 0 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}$ find $A^2 - B^2$ (4 pts)

11. Simplify (4 pts)

a. $2\left(\sin\left(\frac{x}{2}\right)\right)^2 + \cos x$

12. Verify the identities; Make sure to write detailed steps. (4 pts each)

a. $\frac{\sin 2x}{\sin x} - \frac{\cos 2x}{\cos x} = \sec x$

b. $\sin^2 x \tan^2 x = \tan^2 x - \sin^2 x$

13. Simplify: (3 pts each)

a. $\sin[\tan^{-1}(-1)]$

b. $\cos^{-1}\left(\sin\frac{\pi}{2}\right)$

14. Solve each of the following on the interval $[0, 2\pi)$: (4 pts each)

a. $2\cos^2x\tan x = \tan x$

b. $(\sin x + \cos x)^2 = 1$

15. Match the graph with the appropriate function. (Every function is only used once) (2pts each)

a. $\sin^2 x + \cos^2 x = y$

b. $(x - 3)^2 + y^2 = \frac{25}{4}$

c. $f(x) = 2\left(\frac{1}{2}\right)^x$

d. $r = 3\cos 2\theta$

e. $f(x) = 2\log x + 3$

f. $y = -2\sin x$

g. $y = (x + 1)^2 - 1$

h. $r = 1 + \sin\theta$

