

## Review Problems

1. Simplify each of the following.

a)  $\ln\left(\frac{1}{e^2}\right)$

d)  $\log_{10} 0.0001$

g)  $5^{\log_{25} 20} - (e^2)^{\ln 3} + e^{\ln 5}$

b)  $3^{\log_9 m}$

e)  $\log_8\left(\frac{1}{16}\right)$

h)  $\frac{\sin 15^\circ}{\cos 75^\circ} + \left(\frac{1}{3}\right)^{-2} + \cos 10^\circ + \cos 170^\circ$

c)  $8^{\log_2 10}$

f)  $4^{\log_2 p} \cdot e^{-\ln p} - \log_{10} 100$

2. Which of the following is NOT equivalent to  $x^{-8/3}$ ?

A)  $\frac{1}{(\sqrt[3]{x})^8}$

B)  $\frac{1}{\sqrt[3]{x^8}}$

C)  $\frac{1}{x^2 \sqrt[3]{x^2}}$

D)  $\frac{\sqrt[3]{x}}{x^3}$

E)  $\sqrt[3]{-x^8}$

3. a) The number of bacteria increased by 6% overnight. If this morning there are 26 457 600, how many were there last night?

b) The number of bacteria increased by 60% overnight. If this morning there are 26 457 600, how many were there last night?

c) The number of bacteria increased by 160% overnight. If this morning there are 26 457 600, how many were there last night?

4. Find the exact values of all trigonometric functions of  $\beta$  if we know that  $\cos \beta = -\frac{12}{13}$  and  $\beta$  is not in the third quadrant.

5. Which of the following is NOT equal to  $\sin \alpha$ ?

A)  $\sin(\alpha + 360^\circ)$

B)  $\sin(\alpha + 180^\circ)$

C)  $\sin(180^\circ - \alpha)$

D)  $\cos(90^\circ - \alpha)$

6. Which of the following is NOT equal to  $\cos \alpha$ ?

A)  $\cos(\alpha + 360^\circ)$

B)  $\cos(-\alpha)$

C)  $\cos(180^\circ - \alpha)$

D)  $\sin(90^\circ - \alpha)$

7. Which of the following is NOT equal to  $\tan \alpha$ ?

A)  $\tan(\alpha + 360^\circ)$

B)  $\tan(\alpha + 180^\circ)$

C)  $-\tan(180^\circ - \alpha)$

D)  $\tan(90^\circ - \alpha)$

8. Find the exact value of  $\sin x \cos x$  if  $\tan x = 4$ .

9. Solve each of the following equations.

a)  $\log_3(4x - 1) = -2$

e)  $2^{x-4} + 5 = 1$

i)  $\tan^4 x = 3 \tan^2 x$

b)  $\ln(2x + 5) = 3$

f)  $\log_x 10 = 2$

j)  $-4 \cos x = 4 + \sin^2 x$

c)  $10^{3x-1} = 7$

g)  $\cos x + \cos x \tan x = 0$

k)  $\cos^2 x = \frac{1}{2}$

d)  $3e^{-2x+1} - 4 = 11$

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

l)  $\sin x = -\cos x$

10. Find the domain for each of the following functions.

a)  $f(x) = \ln(\cos^2 x)$       d)  $f(x) = \sqrt{x-2} - \sqrt{5-x}$       g)  $f(x) = \log_{10}(6x-x^2) + \sqrt{x-3}$

b)  $f(x) = \frac{2x-3}{\log_2(x-3)-1}$       e)  $f(x) = \ln(x^2-3x)$

c)  $f(x) = \frac{\sin x}{x^2+10}$       f)  $f(x) = \cot x$

11. A point  $P$  is located 15 units away from the center of a circle with radius 8 units. Find an approximate value of the angle formed by the two tangent lines drawn to the circle from  $P$ .

12. Find both coordinates of all points where the following graphs intersect each other.

a)  $x^2 + (y-4)^2 = 25$  and  $(x-6)^2 + (y-1)^2 = 10$

b)  $(x+2)^2 + (y+2)^2 = 5$  and  $(x-2)^2 + y^2 = 5$

c)  $(x+5)^2 + (y-3)^2 = 13$  and  $(x-4)^2 + (y+3)^2 = 52$

13. Suppose that  $p$  and  $q$  are real numbers such that  $p$  is twenty less than twice  $q$ . Find the smallest value of      a)  $p^2 + q^2$       b)  $pq$

14. The angles of a triangle are consecutive elements of an arithmetic sequence. What can we state about this triangle?

## Review Problems - Answers

1.) a)  $-2$     b)  $\sqrt{m}$     c)  $1000$     d)  $-4$     e)  $-\frac{4}{3}$     f)  $p-2$     g)  $\sqrt{20}-4$     h)  $10$

2.) E      3.) a)  $24\,960\,000$     b)  $16\,536\,000$     c)  $10\,176\,000$

4.)  $\sin \beta = \frac{5}{13}$ ,  $\cos \beta = -\frac{12}{13}$ ,  $\tan \beta = -\frac{5}{12}$ ,  $\csc \beta = \frac{13}{5}$ ,  $\sec \beta = -\frac{13}{12}$ ,  $\cot \beta = -\frac{12}{5}$

5.) B    6.) C    7.) D    8.)  $\frac{4}{17}$

9.) a)  $\frac{5}{18}$     b)  $\frac{1}{2}(e^3-5)$     c)  $\frac{1}{3}(1+\log_{10}7)$     d)  $\frac{1}{2}(1-\ln 5)$     e) no solution    f)  $\sqrt{10}$

g)  $\frac{\pi}{2} + k\pi$ ,  $-\frac{\pi}{4} + k\pi$ ,  $k \in \mathbb{Z}$     h)  $\frac{\pi}{2} + 2k\pi$ ,  $-\frac{\pi}{6} + 2k\pi$ ,  $-\frac{5\pi}{6} + 2k\pi$ ,  $k \in \mathbb{Z}$     i)  $k\pi$ ,  $\pm\frac{\pi}{3} + k\pi$ ,  $k \in \mathbb{Z}$

j)  $\pi + 2k\pi$ ,  $k \in \mathbb{Z}$     k)  $\pm\frac{\pi}{4} + k\pi$ ,  $k \in \mathbb{Z}$     l)  $-\frac{\pi}{4} + k\pi$ ,  $k \in \mathbb{Z}$

10.) a)  $x \neq \frac{\pi}{2} + k\pi$ ,  $k \in \mathbb{Z}$     b)  $x > 3$  and  $x \neq 5$     c)  $\mathbb{R}$     d)  $2 \leq x \leq 5$     e)  $x < 0$  or  $x > 3$

f)  $x \neq k\pi$ ,  $k \in \mathbb{Z}$     g)  $3 \leq x < 6$     11.)  $64.46191^\circ$     12.) a)  $(5,4)$  and  $(3,0)$     b)  $(0,-1)$     c)  $(-2,1)$

13.) a)  $80$  when  $q = 8$  and  $p = -4$     b)  $-50$  when  $q = 5$  and  $p = -10$     14.) one angle is  $60^\circ$