

## Review Problems

1. Find the exact value of each of the following expressions.

a)  $\sin\left(\frac{5\pi}{2}\right) - \cos\left(\frac{7\pi}{3}\right) + \tan\left(\frac{3\pi}{4}\right) - \cos(7\pi)$       c)  $\cos 420^\circ - \tan 210^\circ + \sec 240^\circ + \cot 135^\circ$   
 b)  $\log_{10}(0.01) + \log_8\left(\frac{1}{2}\right) - \ln\left(\frac{1}{e^5}\right)$

2. Simplify each of the following.

a)  $-3^{-2}$       e)  $\log_{81} 3$       i)  $\ln(e^3)$       m)  $9^{\log_3 7}$       q)  $e^{\ln 2}$   
 b)  $(-3)^{-2}$       f)  $\log_5 1$       j)  $\log_{49} 7$       n)  $5^{\log_{25} 36}$       r)  $\log_{100} 1000$   
 c)  $81^{-3/4}$       g)  $\log_5 0$       k)  $\log_4\left(\frac{1}{32}\right)$       o)  $\log_8\left(\frac{1}{16}\right)$       s)  $3^{\log_9 2}$   
 d)  $16^{7/4}$       h)  $\log_m(m^4)$       l)  $\log_8 16$       p)  $\log_{27}\left(\frac{1}{9}\right)$       t)  $\ln\left(\frac{1}{e^2}\right)$

3. Simplify each of the following expressions.

a)  $\log_5(5^b)$       c)  $\log_2\left(\left(\frac{1}{8}\right)^p\right)$       e)  $3^{\log_3 4}$       g)  $3^{\log_9 2}$   
 b)  $\log_5(125^m)$       d)  $\log_{16}(2^x)$       f)  $9^{\log_3 5}$       h)  $2^{\log_8 10}$

4. Find all angles  $\beta$  so that twice  $\beta$  is coterminal with  $120^\circ$ . Express your answer

a) in degrees      b) in radians  
 c) Find all coterminal angles  $\beta$  such that  $-500^\circ < \beta < 500^\circ$ .

5. Simplify each of the following. (i.e. write it in terms of trigonometric functions of  $\alpha$ .)

a)  $\sin(90^\circ - \alpha)$       d)  $\sin(\alpha + 180^\circ)$       g)  $\cos(-\alpha)$       j)  $\tan(180^\circ - \alpha)$   
 b)  $\sin(180^\circ - \alpha)$       e)  $\cos(90^\circ - \alpha)$       h)  $\cos(\alpha + 180^\circ)$       k)  $\tan(-\alpha)$   
 c)  $\sin(-\alpha)$       f)  $\cos(180^\circ - \alpha)$       i)  $\tan(90^\circ - \alpha)$       l)  $\tan(\alpha + 180^\circ)$

6. a) Find the exact value of  $\cos x$  if  $\sin x = \frac{2}{5}$ .

b) Find the exact value of  $\sin x$  if  $\cot x = -2$  and  $x$  is not in the second quarter.

7. Solve each of the following equations. Present your solution in both degrees and radians.

a)  $\sin x = -\frac{1}{2}$       c)  $\tan x = -1$       e)  $\cos x = -1$       g)  $\cot x = \sqrt{3}$   
 b)  $\cos x = \frac{1}{\sqrt{2}}$       d)  $\sin x = \sqrt{3}$       f)  $\sec x = 2$

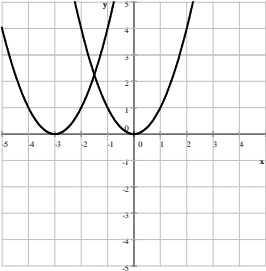
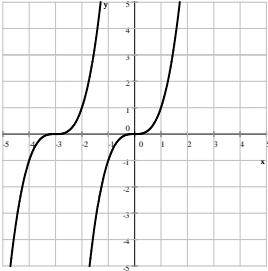
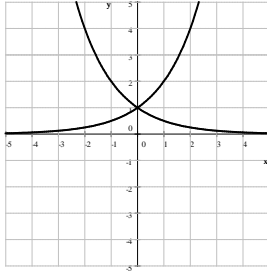
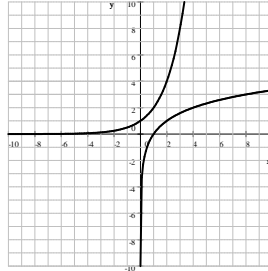
8. Place each of the following logarithms between two consecutive integers.

a)  $\log_2 20$       c)  $\log_3 10$       e)  $\log_{10} 314$       g)  $\log_2 1000$   
 b)  $\log_5 100$       d)  $\log_{10} 2011$       f)  $\log_2 100$       h)  $\log_3 100$

9. Re-write each of the following logarithmic statements as an exponential statement.
- a)  $\ln x = 10$       c)  $\log_7 21 = y$       e)  $\log_A B = C$       g)  $\log_x 5 = 2$   
 b)  $\log_3 P = -2$       d)  $\log_x y = 4$       f)  $\log_2(x+1) = -2$       h)  $\ln(x-5) = 1$
10. Re-write each of the following exponential statements as a logarithmic statement.
- a)  $A^B = C$       b)  $4^x = 7$       c)  $3^{A-1} = 12$       d)  $e^x = 24$
11. Solve each of the following equations for  $x$ . Present the exact value of each solution. (Hint: re-write the logarithmic statements as exponential statements!)
- a)  $\log_5 x = 3$       d)  $\ln(x-1) = -2$       g)  $\frac{2}{3} \ln(x-1) - 1 = 5$   
 b)  $\log_x 16 = 2$       e)  $\log_3(2x^2 - 5) = 3$       h)  $\frac{\log_2(5x+1) - 1}{3} = -1$   
 c)  $\frac{1}{2} \log_2(3x+1) = 3$       f)  $\log_{10}(x-2) = -1$
12. Find the domain of each of the following functions.
- a)  $f(x) = \log_3(x+7)$       d)  $f(x) = \log_5(x^2 - 7x - 30)$       g)  $f(x) = \csc x$   
 b)  $f(x) = \sqrt{x+7}$       e)  $f(x) = \sqrt{x^2 - 7x - 30}$       h)  $f(x) = \tan x$   
 c)  $f(x) = \frac{1}{x+7}$       f)  $f(x) = \frac{1}{x^2 - 7x - 30}$       i)  $f(x) = \frac{x-2}{\sqrt{x-4}-3}$
13. Graph each of the following pairs of functions together, in the same coordinate system.
- a)  $f(x) = x^2$  and  $g(x) = (x+3)^2$       c)  $f(x) = 2^x$  and  $g(x) = \left(\frac{1}{2}\right)^x$   
 b)  $f(x) = x^3$  and  $g(x) = (x+3)^3$       d)  $f(x) = 2^x$  and  $g(x) = \log_2 x$
14. a) Find the first element and common difference in the arithmetic sequence where  $a_7 = -14$  and  $s_7 = -14$ .  
 b) The first element in an arithmetic sequence is 100. Find the common difference if  $s_{25}$  is 64 times  $a_{26}$ .

## Review Problems - Answers

1. a)  $\frac{1}{2}$       b)  $\frac{8}{3}$       c)  $-\frac{\sqrt{3}}{3} - \frac{5}{2}$
2. a)  $-\frac{1}{9}$       b)  $\frac{1}{9}$       c)  $\frac{1}{27}$       d) 128      e)  $\frac{1}{4}$       f) 0      g) undefined      h) 4      i) 3      j)  $\frac{1}{2}$   
 k)  $-\frac{5}{2}$       l)  $\frac{4}{3}$       m) 49      n) 6      o)  $-\frac{4}{3}$       p)  $-\frac{2}{3}$       q) 2      r)  $\frac{3}{2}$       s)  $\sqrt{2}$       t) -2
3. a)  $b$       b)  $3m$       c)  $-3p$       d)  $\frac{1}{4}x$       e) 4      f) 25      g)  $\sqrt{2}$       h)  $\sqrt[3]{10}$

4. a)  $60^\circ + k \cdot 180^\circ$  where  $k = 0, 1, -1, 2, -2, 3, -3, \dots$   
 b)  $\frac{\pi}{3} + k\pi$  where  $k = 0, 1, -1, 2, -2, 3, -3, \dots$       c)  $-480^\circ, -300^\circ, -120^\circ, 60^\circ, 240^\circ, 420^\circ$
5. a)  $\cos \alpha$     b)  $\sin \alpha$     c)  $-\sin \alpha$     d)  $-\sin \alpha$     e)  $\sin \alpha$     f)  $-\cos \alpha$     g)  $\cos \alpha$   
 h)  $-\cos \alpha$     i)  $\cot \alpha$     j)  $-\tan \alpha$     k)  $-\tan \alpha$     l)  $\tan \alpha$
6. a)  $\pm \frac{\sqrt{21}}{5}$     b)  $-\frac{1}{\sqrt{5}} = -\frac{\sqrt{5}}{5}$
7. a) in degrees:  $x = -30^\circ + k \cdot 360^\circ$      $x = -150^\circ + k \cdot 360^\circ$  where  $k \in \mathbb{Z}$   
 in radians:  $x = -\frac{\pi}{6} + 2k\pi$      $x = -\frac{5\pi}{6} + 2k\pi$  where  $k \in \mathbb{Z}$   
 b) in degrees:  $x = \pm 45^\circ + k \cdot 360^\circ$  where  $k \in \mathbb{Z}$     in radians:  $x = \pm \frac{\pi}{4} + 2k\pi$  where  $k \in \mathbb{Z}$   
 c) in degrees:  $x = -45^\circ + k \cdot 180^\circ$  where  $k \in \mathbb{Z}$     in radians:  $x = -\frac{\pi}{4} + k\pi$  where  $k \in \mathbb{Z}$   
 d) no solution  
 e) in degrees:  $x = 180^\circ + k \cdot 360^\circ$  where  $k \in \mathbb{Z}$     in radians:  $x = \pi + 2k\pi$  where  $k \in \mathbb{Z}$   
 f) in degrees:  $x = \pm 60^\circ + k \cdot 360^\circ$  where  $k \in \mathbb{Z}$     in radians:  $x = \pm \frac{\pi}{3} + 2k\pi$  where  $k \in \mathbb{Z}$   
 g) in degrees:  $x = 30^\circ + k \cdot 180^\circ$  where  $k \in \mathbb{Z}$     in radians:  $x = \frac{\pi}{6} + k\pi$  where  $k \in \mathbb{Z}$
8. a)  $4 < \log_2 20 < 5$     b)  $2 < \log_5 100 < 3$     c)  $2 < \log_3 10 < 3$     d)  $3 < \log_{10} 2011 < 4$   
 e)  $2 < \log_{10} 314 < 3$     f)  $6 < \log_2 100 < 7$     g)  $10 < \log_2 1000 < 11$     h)  $4 < \log_3 100 < 5$
9. a)  $e^{10} = x$     b)  $3^{-2} = P$     c)  $7^y = 21$     d)  $x^4 = y$     e)  $A^C = B$     f)  $\frac{1}{4} = x + 1$   
 g)  $x^2 = 5$     h)  $e = x - 5$
10. a)  $\log_A C = B$     b)  $x = \log_4 7$     c)  $A - 1 = \log_3 12$     d)  $x = \ln 24$
11. a) 125    b) 4    c) 21    d)  $\frac{1}{e^2} + 1$     e) 4, -4    f) 2.1    g)  $e^9 + 1$     h)  $-\frac{3}{20}$
12. a)  $x > -7$     b)  $x \geq -7$     c)  $x \neq -7$     d)  $x < -3$  or  $x > 10$     e)  $x \leq -3$  or  $x \geq 10$   
 f)  $x \neq -3, 10$     g)  $x \neq k\pi, k \in \mathbb{Z}$     h)  $x = \frac{\pi}{2} + k\pi, k \in \mathbb{Z}$     i)  $x \geq 4$  but  $x \neq 13$
13.      a)                      b)                      c)                      d)
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14. a)  $a = 10, d = -4$       b)  $-3$