

Please note that Quiz 13 may cover topics from Quizzes 1-12 and Exams 1,2, even if they do not appear here.

1. Graph each of the following functions.

a)  $f(x) = \sin x$  on  $[-2\pi, 2\pi]$

e)  $f(x) = \sqrt[3]{x}$

i)  $f(x) = \log_{1/2} x$

b)  $f(x) = \cos x$  on  $[-2\pi, 2\pi]$

f)  $f(x) = \sqrt{4-x^2}$

j)  $f(x) = x^4$

c)  $f(x) = \tan x$  on  $[-2\pi, 2\pi]$

g)  $f(x) = -|x|$

d)  $f(x) = \frac{1}{x}$

h)  $f(x) = 2^x$

2. 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)  $\log_{10}(0.01) + \log_8\left(\frac{1}{2}\right) - \ln\left(\frac{1}{e^5}\right)$

3. Simplify each of the following.

a)  $\ln(e^{-5})$

d)  $\log_m(m^4)$

g)  $\ln(e^{-3})$

j)  $\ln 1$

m)  $2^{\log_8 x}$

b)  $e^{-\ln 3}$

e)  $\log_{27} 9$

h)  $9^{\log_3 7}$

k)  $25^{\log_5 10}$

c)  $3^{\log_9 A}$

f)  $\ln(-e^3)$

i)  $e^{3\ln 2}$

l)  $5^{\log_{25} 10}$

4. 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)  $2^{\log_8 10}$

5. Simplify each of the following.

a)  $\log_{10} 2 + \log_{10} 5$

c)  $\log_2 24 - \log_2 3$

e)  $\log_3 18 + \log_3 24 - 4\log_3 2$

b)  $\log_6 180 - \log_6 5$

d)  $\log_{10} 40 - 2\log_{10} 2$

f)  $\log_5 0.4 + \log_5 2.5$

6. Write each of the following as a single logarithm. Assume that all variables represent positive numbers.

a)  $\log_{10} a + 2\log_{10} b$

c)  $1 + \log_3 2$

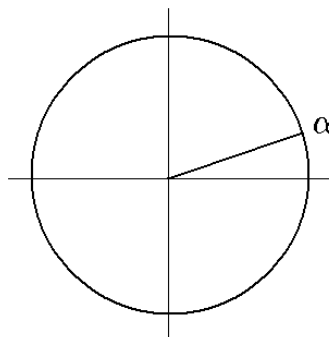
e)  $\frac{1}{2} - \log_7 x$

b)  $\frac{1}{3}\log_2 a - 3\log_2 b$

d)  $2 + \log_5 3$

f)  $2 + \ln 3 + \ln x - 2\ln y$

7. The picture below shows an angle  $\alpha$  on the unit circle.

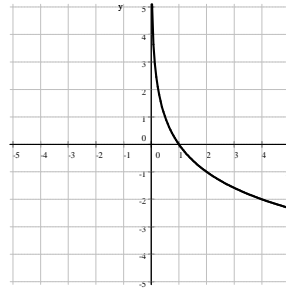
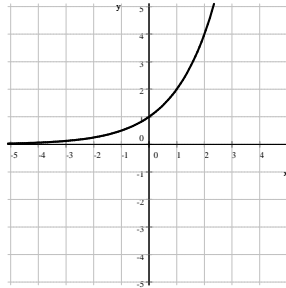
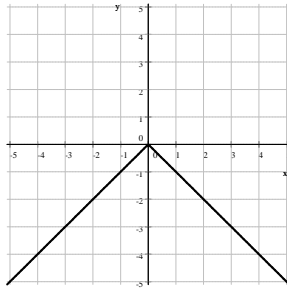
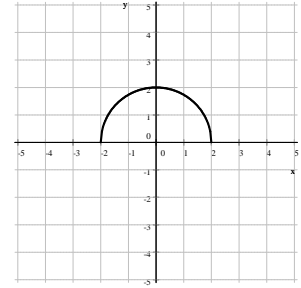
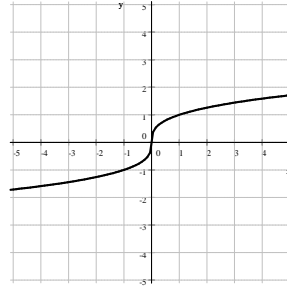
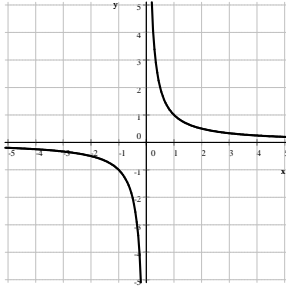


Draw each of the following angles in the same circle.

- a)  $-\alpha$                       b)  $\alpha - 180^\circ$                       c)  $\alpha + 90^\circ$
8. Suppose that  $x$  is an acute angle.
- a) Find the exact value of  $\cos x$  if  $\sin x = \frac{2}{5}$ .                      b) Find the exact value of  $\sin x$  if  $\cot x = 2$ .
9. 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)  $\tan(\alpha + 180^\circ)$
10. 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  $-500^\circ < \beta < 500^\circ$ .
11. Solve each of the following equations.
- a)  $1 - \sin x = 2 \cos^2 x$                       c)  $\tan^2 x - 3 = 0$                       e)  $\sin x = -2 \cos x \sin x$   
 b)  $2 \cos^2 x = \cos x$                       d)  $\tan^2 x + \tan x = 0$                       f)  $\sec x = 2$
12. Solve each of the following equations for  $x$ . Present the exact value of each solution. (Hint: re-write the exponential statements as logarithmic statements!)
- a)  $2^{3x-1} = 4$                       b)  $3^{2x-1} = 5$                       c)  $e^{t-2} = 5$                       d)  $2 + 5e^{x-1} = 2012$
13. 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)  $\log_3(2x^2 - 5) = 3$   
 c)  $\frac{1}{2} \log_2(3x + 1) = 3$                       f)  $\log_{10}(x - 2) = -1$                       h)  $\frac{\log_2(5x + 1) - 1}{3} = -1$
14. 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)  $f(x) = \frac{x - 2}{\sqrt{x - 4} - 3}$
15. 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  $g(x) = \log_2 x$
16. a) Samantha got a 4% raise. Now her monthly salary is \$2496. How much was her salary before the raise?  
 b) A TV set went on a 15% off sale. The sale price is \$1020. What was the original price of the TV set?

Answers

1. a) b) c) see handout      d)  $f(x) = \frac{1}{x}$       e)  $f(x) = \sqrt[3]{x}$       f)  $f(x) = \sqrt{4-x^2}$

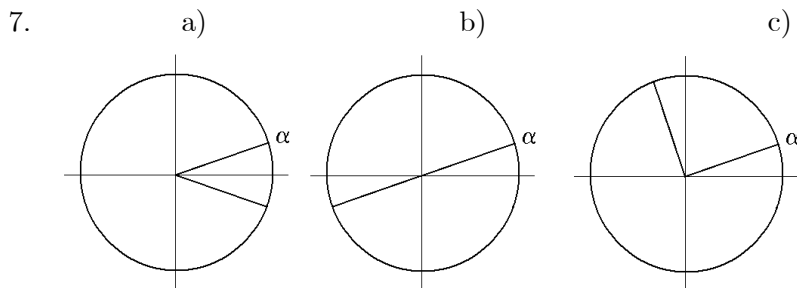


- g)  $f(x) = -|x|$       h)  $f(x) = 2^x$       i)  $f(x) = \log_{1/2} x$

2. a)  $\frac{1}{2}$       b)  $\frac{8}{3}$       c)  $-\frac{\sqrt{3}}{3} - \frac{5}{2}$   
 3. a)  $-5$       b)  $\frac{1}{3}$       c)  $\sqrt{A}$       d)  $4$       e)  $\frac{2}{3}$       f) undefined      g)  $-3$       h)  $49$       i)  $8$       j)  $0$       k)  $100$   
 l)  $\sqrt{10}$       m)  $\sqrt[3]{x}$

4. a)  $b$       b)  $3m$       c)  $-3p$       d)  $\frac{1}{4}x$       e)  $4$       f)  $25$       g)  $\sqrt{2}$       h)  $\sqrt[3]{10}$   
 5. a)  $1$       b)  $2$       c)  $3$       d)  $1$       e)  $3$       f)  $0$

6. a)  $\log_{10} ab^2$       b)  $\log_2 \left( \frac{\sqrt[3]{a}}{b^3} \right)$       c)  $\log_3 6$       d)  $\log_5 75$       e)  $\log_7 \left( \frac{\sqrt{7}}{x} \right)$       f)  $\ln \left( \frac{3e^2 x}{y^2} \right)$



8. a)  $\frac{\sqrt{21}}{5}$       b)  $\frac{\sqrt{5}}{5}$   
 9. 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)  $\tan \alpha$

10. 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)  $-480^\circ, -300^\circ, -120^\circ, 60^\circ, 240^\circ, 420^\circ$

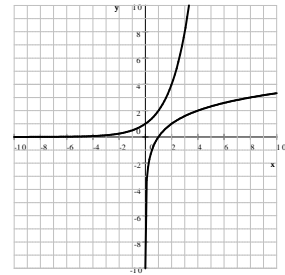
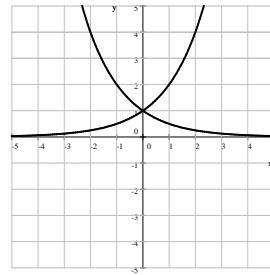
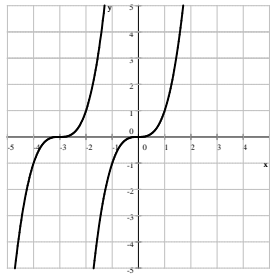
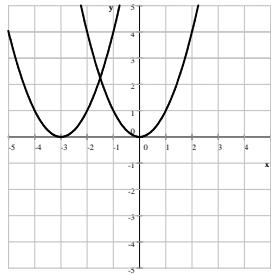
11. a)  $x = \frac{\pi}{2} + 2k\pi$  or  $x = -\frac{\pi}{6} + 2k\pi$  or  $x = -\frac{5\pi}{6} + 2k\pi$  where  $k \in \mathbb{Z}$   
 b)  $x = \pm\frac{\pi}{3} + 2k\pi$  or  $x = \frac{\pi}{2} + k\pi$  where  $k \in \mathbb{Z}$  c)  $x = \pm\frac{\pi}{3} + k\pi$  where  $k \in \mathbb{Z}$   
 d)  $x = k\pi$  or  $x = -\frac{\pi}{4} + k\pi$  where  $k \in \mathbb{Z}$  e)  $x = k\pi$  or  $x = \pm\frac{2\pi}{3} + 2k\pi$  where  $k \in \mathbb{Z}$   
 f)  $x = \pm\frac{\pi}{3} + 2k\pi$  where  $k \in \mathbb{Z}$

12. a) 1 b)  $\frac{1}{2}(1 + \log_3 5)$  or  $\log_9 15$  c)  $2 + \ln 5$  d)  $1 + \ln 402$

13. a) 125 b) 4 c) 21 d)  $\frac{1}{e^2} + 1$  e) 4, -4 f) 2.1 g)  $e^9 + 1$  h)  $-\frac{3}{20}$

14. 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  $x \neq 13$

15. a) b) c) d)



16. a) \$2400 b) \$1200