

Quiz 9 will also cover material from Quizzes 1-8 and Exam 1. Review those topics even if they do not appear in this review.

1. Simplify each of the following.

a) $\sin 30^\circ \sin 45^\circ \sin 60^\circ + \cos 30^\circ \cos 45^\circ \cos 60^\circ$

c) $\cos^2 17^\circ + \sin^2 17^\circ$

b) $\tan 30^\circ - \tan 45^\circ + \tan 60^\circ$

d) $\cos^2 30^\circ - \sin^2 30^\circ$

2. Simplify each of the following.

a) -3^{-2}

f) $\log_5 1$

j) $\log_{49} 7$

n) $2^{\log_2 16}$

q) $3^{\log_3(1/9)}$

b) $(-3)^{-2}$

g) $\log_5 0$

k) $\log_4 \left(\frac{1}{32} \right)$

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

r) $\log_{100} 1000$

c) $81^{-3/4}$

h) $\log_m (m^4)$

l) $\log_8 16$

p) $\log_{27} \left(\frac{1}{9} \right)$

s) $\log_2 \left(\frac{1}{32} \right)$

d) $16^{7/4}$

i) $\log_{1/2} \left(\frac{1}{8} \right)$

m) $5^{\log_5 125}$

t) $2^{-\log_2 4}$

e) $\log_{81} 3$

3. 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) $\log_{10} 2012$

f) $\log_2 100$

h) $\log_3 100$

4. Re-write each of the following logarithmic statements as an exponential statement.

a) $\log_2 x = 10$

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) $\log_{1.3} (x - 5) = 1$

5. 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) $e^x = 24$

6. Let $f(x) = \frac{x-2}{3x+6}$. Simplify each of the following.

a) $f(0)$

d) $f\left(\frac{2}{3}\right)$

f) $f(2) + f(3)$

i) $2f(a)$

l) $f\left(f\left(\frac{1}{2}\right)\right)$

b) $f(1)$

g) $f(2+3)$

j) $f(2a)$

c) $f(-1)$

e) $f(-2)$

h) $f(a)$

k) $f(f(2))$

m) Compute the value of x for which $f(x) = \frac{1}{7}$.

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

a) $f(x) = \frac{1}{x+3}$

c) $d(x) = \frac{1}{x^2+x}$

e) $f(t) = \frac{t-2}{3t+6}$

g) $s(t) = \sqrt{4-t^2}$

b) $g(x) = \sqrt{x+3}$

d) $r(y) = \sqrt{y^2+y}$

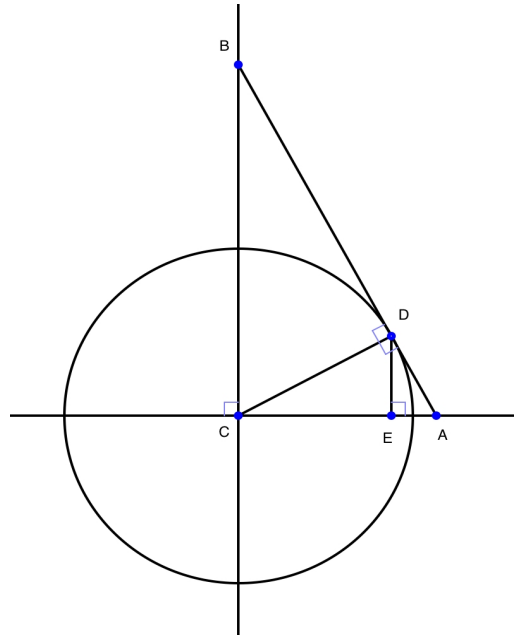
f) $f(a) = \frac{1}{5-\sqrt{a-2}}$

h) $m(x) = \frac{1}{4-m^2}$

22. Seattle, WA and Los Angeles, CA have approximately the same longitude. The latitude of Seattle is 47.6° and that of Los Angeles is 34.1° . Find the distance to the nearest mile between the two cities. (The radius of the earth is approximately 3960 miles.)

23. Consider the picture shown below. Line AB is tangent to the unit circle, where D is the point of tangency. Let α denote angle DCE . Match each of the six trigonometric functions with the length of each of the line segments given.

$\sin \alpha$, $\cos \alpha$, $\tan \alpha$, $\csc \alpha$, $\sec \alpha$, $\cot \alpha$ and AC , AD , BC , BD , CE , DE



Answers

- 1.) a) $\frac{\sqrt{6}}{4}$ b) $\frac{4\sqrt{3}}{3} - 1$ c) 1 d) $\frac{1}{2}$
- 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) 125 n) 16 o) $-\frac{4}{3}$ p) $-\frac{2}{3}$ q) $\frac{1}{9}$ r) $\frac{3}{2}$ s) -5 t) $\frac{1}{4}$
- 3.) a) $4 < \log_2 20 < 5$ b) $2 < \log_5 100 < 3$ c) $2 < \log_3 10 < 3$ d) $3 < \log_{10} 2012 < 4$
 e) $2 < \log_{10} 314 < 3$ f) $6 < \log_2 100 < 7$ g) $9 < \log_2 1000 < 10$ h) $4 < \log_3 100 < 5$
- 4.) a) $2^{10} = x$ 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) $1.3 = x - 5$ 5.) a) $\log_A C = B$ b) $x = \log_4 7$ c) $A - 1 = \log_3 12$ d) $x = \ln 24$
- 6.) a) $-\frac{1}{3}$ b) $-\frac{1}{9}$ c) -1 d) $-\frac{1}{6}$ e) undefined f) $\frac{1}{15}$ g) $\frac{1}{7}$ h) $\frac{a-2}{3a+6}$ i) $\frac{2a-4}{3a+6}$ j) $\frac{a-1}{3a+3}$
 k) $-\frac{1}{3}$ l) $-\frac{11}{27}$ m) 5

- 7.) a) $x \neq -3$ b) $x \geq -3$ c) $x \neq 0, -1$ d) $y \leq -1$ or $y \geq 0$ e) $t \neq -2$ f) $a \geq 2$ and $a \neq 27$
 g) $-2 \leq t \leq 2$ h) $m \neq \pm 2$

8.) a) 200 b) $\frac{2500}{7}$ 9.) 211.51092 ft 10.) $\frac{3 - \sqrt{13}}{2}, \frac{3 + \sqrt{13}}{2}$

11.) a) -5, 10 b) 11 ($-\frac{19}{3}$ doesn't work) c) 7 d) 5 (17 doesn't work)

12.) a) $\frac{375}{2\pi} \text{ m} \approx 59.68310366 \text{ m}$ b) $\frac{5\sqrt{15}}{\sqrt{\pi}} \text{ m} \approx 10.925484 \text{ m}$ 13.) $c \approx 18.6088167$ $b \approx 7.568888$

14.) False. For example, consider $\alpha = 30^\circ$.

Then $\sin 2\alpha = \sin 60^\circ = \frac{\sqrt{3}}{2}$ and $2 \sin \alpha = 2 \sin 30^\circ = 2 \left(\frac{1}{2}\right) = 1$.

15.) a) $-\frac{3}{4}$ b) $\sqrt{3} - 1$ c) 1 d) 1 e) $\sqrt{2} - \frac{4}{3}$ f) $\sqrt{3} - 2$ g) $-\frac{1}{2}$ h) $\frac{4\sqrt{3}}{3} + 1$

16.) a) $1 + \tan^2 x = \sec^2 x$

$$\text{LHS} = 1 + \tan^2 x = 1 + \frac{\sin^2 x}{\cos^2 x} = \frac{\cos^2 x}{\cos^2 x} + \frac{\sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} = \sec^2 x = \text{RHS}$$

b) $\frac{\cot x - 1}{\cot x + 1} = \frac{1 - \tan x}{1 + \tan x}$

$$\text{LHS} = \frac{\cot x - 1}{\cot x + 1} = \frac{\frac{1}{\tan x} - 1}{\frac{1}{\tan x} + 1} \cdot \frac{\tan x}{\tan x} = \frac{1 - \tan x}{1 + \tan x} = \text{RHS}$$

c) $\sin^2 x \cos^3 x = (\sin^2 x - \sin^4 x) \cos x$

$$\text{RHS} = (\sin^2 x - \sin^4 x) \cos x = \sin^2 x (1 - \sin^2 x) \cos x = \sin^2 x \cos^2 x \cos x = \text{LHS}$$

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

$$\text{LHS} = (\sin x + \cos x)^2 = \sin^2 x + \cos^2 x + 2 \sin x \cos x = 1 + 2 \sin x \cos x = \text{RHS}$$

e) $\cos x (\sec x - \cos x) = \sin^2 x$

$$\text{LHS} = \cos x (\sec x - \cos x) = \cos x \left(\frac{1}{\cos x} - \cos x \right) = 1 - \cos^2 x = \sin^2 x = \text{RHS}$$

f) $\frac{\sin x}{1 - \cos x} = \frac{1 + \cos x}{\sin x}$

$$\text{LHS} = \frac{\sin x}{1 - \cos x} = \frac{\sin x}{1 - \cos x} \cdot \frac{1 + \cos x}{1 + \cos x} = \frac{\sin x (1 + \cos x)}{1 - \cos^2 x} = \frac{\sin x (1 + \cos x)}{\sin^2 x} = \frac{1 + \cos x}{\sin x} = \text{RHS}$$

17.) $\frac{\sqrt{5}}{3}$ 18.) a) $\frac{\sqrt{21}}{5}$ b) $\frac{7}{\sqrt{65}} = \frac{7\sqrt{65}}{65}$ 19.) $900 \cos 20^\circ \sin 20^\circ \text{ cm}^2 \approx 289.25442436 \text{ cm}^2$ 20.) a) $8\sqrt{5} \text{ m}^2$

b) $\cos^{-1} \left(\frac{4}{6} \right)$ c) 48.1897° 21.) 38.94244° 22.) 933 miles

23.) $\sin \alpha = DE$ $\cos \alpha = CE$ $\tan \alpha = AD$ $\csc \alpha = BC$ $\sec \alpha = AC$ $\cot \alpha = BD$