Practice problems

Most of the answers are at the end of this document. Solutions with work can be found at strongmathclass.weebly.com

1.) Solve for x, showing your work: $\log_5 \frac{1}{125} = x$

2.) Solve for x, showing your work:

a) log 25 + log x = log 125.

b) log x + log(2x - 5) = log 12.

3.) Simplify using properties of exponents:

a) $x^2(3x^3y^2)^3$

b) $\frac{81x^8}{27x}$

4.) Rewrite the following expressions as a single logarithm without using a calculator. Leave your answer in exact form.

a. log 9 + log 10 - log 5 =

b. $\log_5$ 250 + 2$\log_5$ 2 =

5.) Multiple Choice: Which of the following is the inverse of $f(x) = \frac{1}{2}\sqrt{2x+1}$?

A. $f^{-1}(x) = \frac{2x^2-1}{2}$

B. $f^{-1}(x) = \frac{4x^2-1}{2}$

C. $f^{-1}(x) = \frac{(2x-1)^2}{2}$

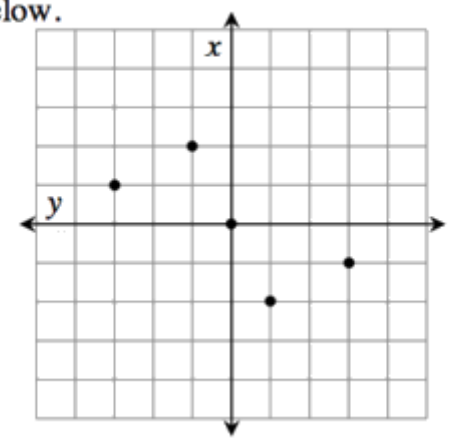
D. $f^{-1}(x) = \frac{(4x-1)^2}{2}$

Explain your reasoning or show the work that helped you decide on your answer.

6.) *"I have no idea how to do this problem!"* Eleanor exclaimed. *"What's the problem?"* Kevin asked. *"I'm supposed to graph the inverse of this … this … I don't know WHAT this is!"* Eleanor whines. *"Calm down, calm down. Let me see what you have,"* Kevin says soothingly to Eleanor.

Eleanor slides the problem below towards Kevin.

Graph the inverse of the function shown below.



"This isn't so bad," Kevin reassures Eleanor. *"Then YOU tell me how to do this problem!"* Eleanor replies.

This is your chance to show both of them all you know. Solve this problem for Eleanor and Kevin, explaining clearly why you know your answer is correct.

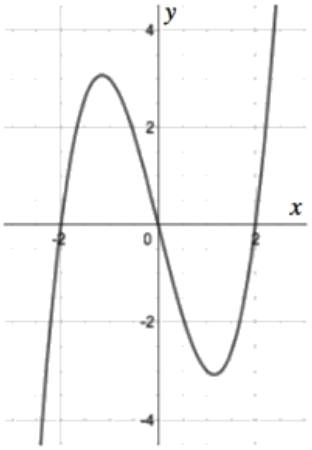
7.) Calculate the value of each of the following without using a calculator.

a. $\log 1000$ b. $\log_2 64$

c. $\log_8\left(\frac{1}{64}\right)$ d. $\log 0.01$

8.) What happens if you find the inverse of an invertible function f(x), and then you find the inverse of the inverse? Explain.

9.) Consider the graph of $f(x)$ below.



a. Is $f(x)$ a function? Explain.

b. Sketch in the graph of the inverse of $f(x)$. Label it $f^{-1}(x)$.

c. Is $f^{-1}(x)$ a function? Explain.

10.) Write and solve a system of equations to solve the following problem.

Randy bought 3 CD's and 2 records for $60. Sara bought 1 CD and 5 records for $52.50. If the store has one price for CD's and one (different) price for records, what is the cost for each item sold separately?

11.) What are the inverse of each of the following functions? For each, decide whether the inverse is also a function and justify your reasoning. (Sketching a graph might help.)

a. $f(x) = 4(x+3)^2 - 8$

b. $g(x) = \dfrac{20}{x-3}$

12.) Write $\log_r(b) = t$ in exponential form. Then write $c^u = e$ in logarithmic form.

13.) Write the inverse equation for the equation $y = 3x - 5$.

14.) Solve the following equation for x: $3x = 5 - 7x^2$.

15.) What is the point of intersection of the graphs of these two lines? Clearly show an algebraic solution.

$5x - 2y = -36$

$4x + 3y = -15$

16.) Evaluate the following without a calculator

a. $\sin(7\pi/4)$

b. $\cos(-\pi/6)$

c. $\cos(2\pi/3)$

d. $\sin(\pi)$

e. $\cos(\pi)$

f. $\sin(\pi/2)$

g. $\sin(3\pi/2)$

h. $\cos(3\pi/2)$

17.) In a unit circle, sketch an angle measuring approximately four radians. Label it $\angle TUE$.

a. On your diagram, show sin $\angle TUE$.

b. What is the $m\angle TUE$ in degrees? Round to the nearest tenth.

18.) A circle has a radius of 8 cm.

a. How long is the arc on this circle, of a 30° angle?

b. How long is the arc on this circle, of a $\frac{3\pi}{4}$ radian angle?

19.) Sketch a 135° angle on a unit circle. Label it $\angle MON$.

a. What is the reference angle for $\angle MON$? Show it on your diagram.

b. Show, on your diagram, the sine of $\angle MON$.

c. Convert both $\angle MON$ and its reference angle to radians.

20.) Convert each radian measure to degrees.

a. $\frac{4\pi}{3}$ b. 3π c. $\frac{7\pi}{4}$ d. $\frac{5\pi}{6}$

21.) Fill in this table:

Degrees	0°	30°		60°	90°	120°	135°	150°	180°	210°	225°	270°
Radians			$\frac{\pi}{4}$									

Degrees	300°	360°				36°	20°	55°		1°		21°
Radians			$\frac{11\pi}{4}$	6π	-10π				1		6	

Now explain several methods, shortcuts, and patterns you used to complete the table. This is an opportunity for you to show off all you have learned about converting degrees to radians and radians to degrees. The more you show, the better.

22.) Locate and fix the error in the solution at right:

$$8(x-3)-2(x+3)=5(x-1)$$
$$8x-24-2x+5=5x-5$$
$$6x-19=5x-5$$
$$x=14$$

23.) Solve $\frac{x-3}{x+8}=\frac{-2}{3}$. Show all of your steps!

24.) Multiple Choice: Choose the exact value of $\sin\left(\frac{7\pi}{6}\right)$. Explain your reasoning or show the work that helped you decide on your answer.

A. $\frac{1}{2}$

B. $-\frac{1}{2}$

C. $\frac{\sqrt{3}}{2}$

D. $-\frac{\sqrt{3}}{2}$

25.) Fill in the table WITHOUT using a calculator.

Function	$\theta = 30° =$ ___ radians	$\theta = 45° =$ ___ radians	$\theta = 60° =$ ___ radians
$\sin\theta$			
$\cos\theta$			
$\tan\theta$			

26.) Anuar was solving the equation for x but admitted he really was not sure what he was doing. List any mistakes that Anuar made, then rework the problem with the corrections showing all of your work.

$$3x^3+6x^2-45x=0$$
$$3x(x^2+2x-15)=0$$
$$x^2+2x-15=0$$
$$(x-5)(x+3)=0$$
$$x=5 \text{ or } x=-3$$

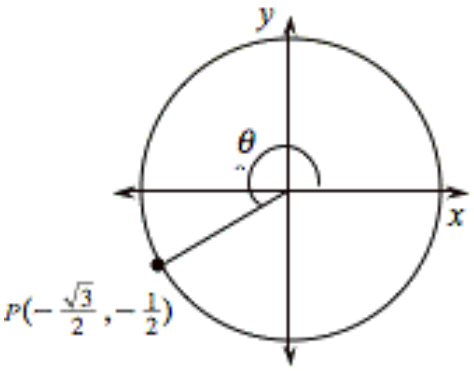
27.) Describe what you would do algebraically to calculate the x- and y-intercepts of $y=x^2-6x-40$. Then do it, showing all work.

28.) Using a unit circle, sketch several angles that have a negative cosine and a positive sine. What do such angles have in common?

29.) Write and solve a system of equations to solve the following problem.

Two cans of soup and three bags of chips cost $10.30. Four cans of soup and two bags of chips cost $14.20. What is the cost for each item sold separately?

30.) A unit circle has angle θ in standard position. Point P is on the circle and the



coordinates of P are shown.

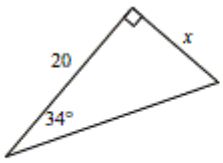
a. What is cos θ? Explain.

b. What is sin θ? Explain.

c. What is the measure of angle θ? Give your answer in radians *and* degrees.

31.) What is the value of x and y for each triangle below? SHOW YOUR SETUP!

a.



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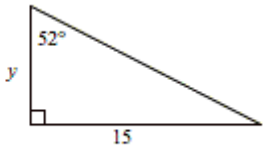
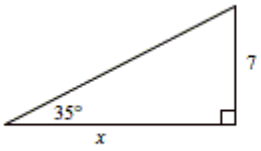
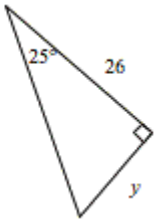


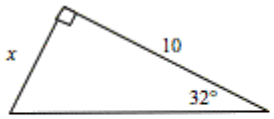
c.



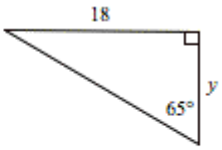
d.



e.



f.



Answers:

1.)

[x = -3]

2.)

[a) x = 5 b) x = 4, we don't use x = -3/2 as it is undefined in the original equation.]

3)

[a) $27x^{11}y^{6}$ b) $3x^{7}$

4.)

[a: log 18; b: $\log_5 1000$]

5.)

[B]

6.)

[Points can represent a function, and so to find the inverse, plot the new points which are the reflection of these points across the line y = x. Or you can plot new points by interchanging the x- and y-coordinates.]

7.)

[a: 3, b: 6, c: -2, d: -2]

8.)

[You would just get the original function f(x) back]

9.)

[a: yes, it passes the vertical line test;
b: students should sketch in the reflection of this graph across the line y = x; c: no, it does not pass the vertical line test]

10.)

[$3C + 2r = 60$ and $C = 5r = 52.5$, CD: \$15, record: \$7.50]

11.)

[a: $f^{-1}(x) = \pm\sqrt{\frac{x+8}{4}} - 3$, not a function; b: $g^{-1}(x) = \frac{20}{x} + 3$, a function]

12.)

[$r^t = b$; $\log_c(e) = u$]

13.)

[$y = \frac{x+5}{3}$]

14.)

[$x = \frac{-3 \pm \sqrt{149}}{14}$]

15.)

[(-6, 3)]

16.)

[a. $-\sqrt{2}/2$ b. $\sqrt{3}/2$ c. $-1/2$ d. 0 e. -1

f. 1 g. -1 h. 0]

17.)

[a: the sine is the y-coordinate of the point, so it is the signed distance from the point on the unit circle to the x-axis. b: ≈ 229°]

18.)

[a: $\frac{4\pi}{3}$, b: 6π]

19.)

[a: the 45° angle, c: $\frac{3\pi}{4}, \frac{\pi}{4}$]

20.)

[a: 240° , b: 540° , c: 315° , d: 150°]

21.)

[reading from left to right, top table: $0, \frac{\pi}{6}, 45^\circ, \frac{\pi}{3}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{5\pi}{6}, \pi, \frac{7\pi}{6}, \frac{5\pi}{4}, \frac{4\pi}{3}, \frac{3\pi}{2}$; bottom table: $\frac{5\pi}{3}, 2\pi, 495^\circ, 1080^\circ, -1080^\circ, , , , , , , \frac{\pi}{5} \frac{\pi}{9} \frac{11\pi}{36} \frac{180}{\pi} \frac{\pi}{180} \frac{1080}{\pi} \frac{7\pi}{60}$]

22.)

[2nd line “+5” should be “-6” ; x = 25]

23.)

[x = -7/5]

24.)

[B]

25.)

[top: $\frac{\pi}{6}$,,$\frac{\pi}{4}\frac{\pi}{3}$, first row: $\frac{1}{2},\frac{\sqrt{2}}{2},\frac{\sqrt{3}}{2}$, second row: $\frac{\sqrt{3}}{2}$,,$\frac{\sqrt{2}}{2}\frac{1}{2}$, third Row: $\frac{\sqrt{3}}{3}, 1, \sqrt{3}, \frac{\sqrt{3}}{3}, 1, \sqrt{3}$]

26.)

[Factored incorrectly, x = 0, -5, or 3]

27.)

[x-intercept: let y = 0, solve for x; y-intercept: let x = 0, solve for y; x-intercept: (10, 0) & (-4, 0); y-intercept: (0, -40)]

28.)

[They are all in the second quadrant, or $\frac{\pi}{2} < 0 < \pi$.]

29.)

[$2s + 3c = 10.30$ and $4s + 2c = 14.2$, can of soup: \$2.75, bag of chips: \$1.60]

30.)

[a: $cos(\theta) = -\frac{\sqrt{3}}{2}$, it is the value of the x-coordinate of the point; b: $sin(\theta) = -\frac{1}{2}$, it is the value of the y-coordinate of the point. c: $210^{o} = \frac{7\pi}{6}$ radians]

31.)

[a: $x \approx 13.49$, b: $y \approx 11.72$, c: $x \approx 9.997$, d: $y \approx 12.12$, e: $x \approx 6.25$, f: $y \approx 8.39$]