

AP Calculus  
Unit 1 Practice Exam

Calc BC

Key

1. Find the slope of the line passing through the points P(7, 8) and Q(-1,3).

$$\frac{\text{Rise}}{\text{Run}} = \frac{-5}{-8} = \frac{5}{8}$$

2. Given the line L:  $y = -\frac{4}{5}x - 2$

- a) Write an equation in slope intercept form for the line passing through the point A(-5, 2) that is parallel to L.

$$m = -\frac{4}{5} \quad y = -\frac{4}{5}x - 4 + 2 \quad \boxed{y = -\frac{4}{5}x - 2}$$

$$y - 2 = -\frac{4}{5}(x + 5)$$

- b) Write an equation in standard form for the line passing through the point B(4, -2) that is perpendicular to L.

$$4y - 8 = -5x - 25$$

$$\boxed{5x + 4y = -17}$$

$$y - 2 = -\frac{5}{4}(x + 5)$$

3. Given the function:  $f(x) = -3 + \sqrt{x^2 - 25}$

- a) What is the domain of  $f(x)$ ?  $x^2 - 25 \geq 0 \quad x^2 \geq 25 \quad |x| \geq 5$

$$\boxed{x \geq 5 \text{ or } x \leq -5}$$

- b) What is the range of  $f(x)$ ?

$$\sqrt{x^2 - 25} \text{ is always } > 0 \quad \therefore \boxed{f(x) \geq -3}$$

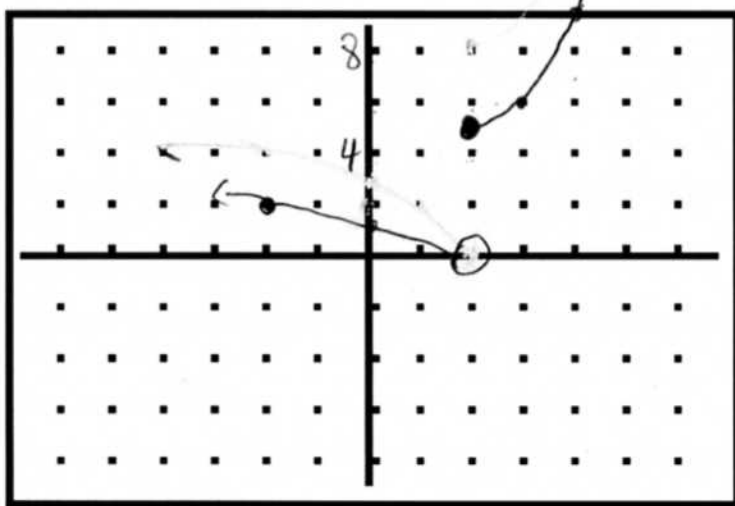
- c) Determine algebraically if  $f(x)$  is an even function, an odd function, or neither. Show your work.

$$f(-x) = -3 + \sqrt{(-x)^2 - 25} = -3 + \sqrt{x^2 - 25} = f(x)$$

odd

4. Sketch the graph of the piecewise function  $g(x) =$

$$\begin{cases} \sqrt{2-x}, & x < 2 \\ x^2 + 1, & x \geq 2 \end{cases}$$



Scale  
bad  
for  
this  
graph

5. Given:  $f(x) = x^2 + 5x - 2$   $f(-11) = 121 - 55 - 2 = 64$   
 $g(x) = 7x - 4$  Find the following (simplify all answers)

a)  $g(f(-11)) = g(64) = (7)(64) - 4 = 444$   $g(6) = 42 - 4 = 38$

b)  $f(g(6)) = 38^2 + 5(38) - 2 = 1636$

6. The function  $y = \sin(2x) \ln(3x) - 4$  has many solutions. Use your calculator to find the first solution. Give your answer correct to three decimal places.

7. If the average daily temperature is  $75^\circ$  the cost of air conditioning is \$4.50 a day. If the average daily temperature is  $80^\circ$ , the cost of air conditioning is \$5.25 a day. Find the average rate of change and explain in terms of this problem.

The cost goes up 0.15 \$/degree.  $\frac{.75}{5} = .15 \frac{\$}{^\circ}$

8. Radioactive decay. The half life of a substance is 3 weeks. There are 14 grams of the substance initially.

$$y = (14)\left(\frac{1}{2}\right)^{t/3}$$

- a) How much of the substance is still radioactive after 8 weeks?

$$y = 14\left(\frac{1}{2}\right)^{8/3} =$$

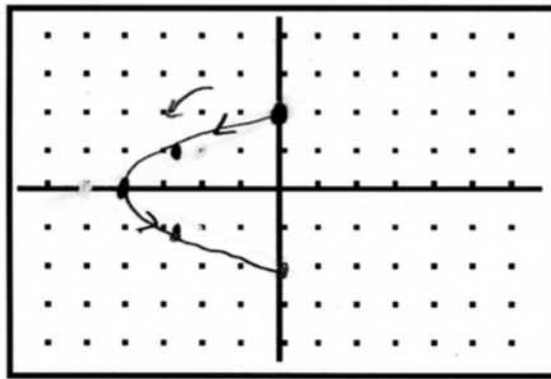
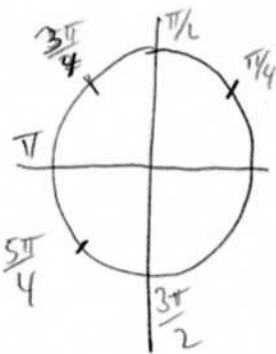
- b) When will there be 9 grams of the substance that is still radioactive?

$$9 = 14\left(\frac{1}{2}\right)^{t/3}$$

9. The parametrization of a curve is given by  $x = 4 \cos t$  and  $y = 2 \sin t$  with  $\frac{\pi}{2} \leq t \leq \frac{3\pi}{2}$ .

$$\cos t = \frac{x}{4} \quad \sin t = \frac{y}{2}$$

- a) Graph the curve. Indicate the direction the curve travels.



t	x	y
$\frac{\pi}{2}$	0	2
$\frac{3\pi}{4}$	$-2\sqrt{2}$	1
$\pi$	-4	0
$\frac{5\pi}{4}$	-2	-1
$\frac{3\pi}{2}$	0	-2

- b) Find a Cartesian equation for the curve. What is the domain and range of the Cartesian equation that matches the parametric form?

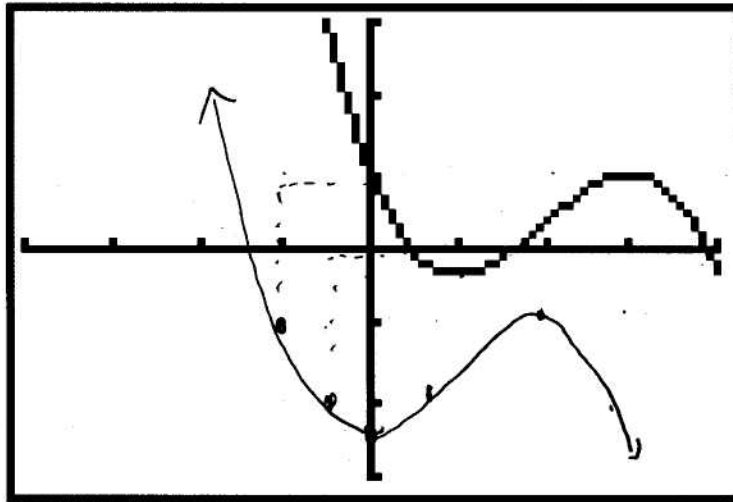
$$\sin^2 t + \cos^2 t = 1$$

$$\frac{x^2}{16} + \frac{y^2}{4} = 1$$

Domain  $-4 \leq x \leq 0$

Range  $-2 \leq y \leq 2$

Extra Credit: The graph of the function  $f$  is shown in the figure.  
Sketch the graph of  $y = f(x + 1) - 2$  (sketch on the same axes)



$[-4,4]$  by  $[-3,3]$

Left 1

Down 2