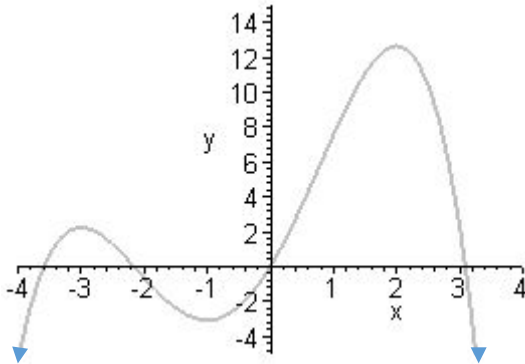


**TURN OFF YOUR CELL PHONE AND PUT IN BAG. IF YOUR CELL PHONE IS SEEN, YOU WILL EARN A “0”. SHOW ALL WORK CLEARLY FOR CREDIT.**

1. Use the graph of  $y=f(x)$  to answer the following: [6]



- a) Give the interval(s) on which  $f(x)$  is decreasing
- b) Give the coordinates of the relative maxima
- c) Give the range in interval notation.

2. Suppose  $f(x) = -x^2 + 2x - 3$ . Find and simplify  $\frac{f(x+h)-f(x)}{h}$  [8]

3. Suppose  $\sin \theta = \frac{2x}{3}$  for some acute angle  $\theta$ . Express in terms of  $x$ . [12]

a)  $\cos \theta$

b)  $\sin(2\theta)$

[35] 4. Solve algebraically. Give exact, simplified answers (no decimals). No work = no credit.

a)  $e^{2x} - e^x - 6 = 0$

b)  $5 \ln(2x - 8) + 3 = 4$

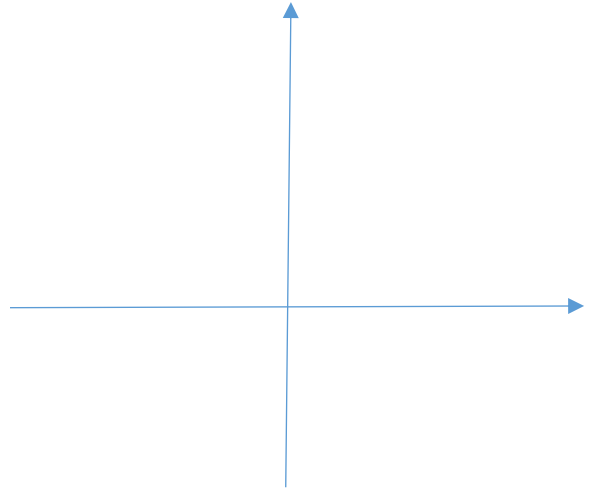
c)  $\frac{1}{p^2 - 4p} + 1 = \frac{p-6}{p}$

d)  $\sqrt{2x + 5} - 4 = 5$

e)  $3x^2 - 2x = 6$

[12] 5. Graph  $f(x) = \frac{2x-3}{x+4}$

- a) State the domain of  $f(x)$
- b) Find the zero(s)
- c) Find the y-intercept
- d) Find the horizontal asymptote, if any.
- e) Find the vertical asymptote, if any.      f) sketch the graph. Label intercepts and dash in asymptotes.



[14] 6a. Graph over one period. **Clearly label** graph pointing out  $x$ -intercepts and maximum and minimum points. Use at least 4 ticks on the  $x$ -axis

$$y = -6 \sin(2x)$$



State max and min in  $(x,y)$  form over the period you graphed. Label as max or min.

6b) Given  $f(x) = -3 \cos(4x - 3)$  state the information:

- a) Period:                      b) amplitude:                      c) Phase shift.                      d) domain

[10] 7. Factor completely

a)  $x^4 - 7x^2 - 144$

b)  $2\sin^3 x - 4\sin^2 x - 16\sin x$

[9] 8. Fill in the chart with EXACT values. Also include the radian measure.

	$x = 30^\circ$ or _____ radians	$x = 45^\circ$ or _____ radians	$x = 60^\circ$ or _____ radians
$\sin(x)$			
$\cos(x)$			
$\tan(x)$			

9. Find the general solution to  $\sin(x) = \frac{-1}{2}$  in radians. [8]

10. Solve  $\cos(3\theta) = \frac{\sqrt{2}}{2}$  where  $0 \leq \theta < 2\pi$  [8]

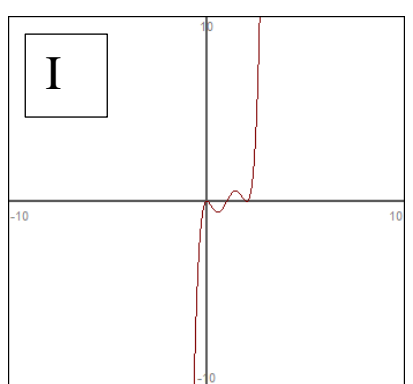
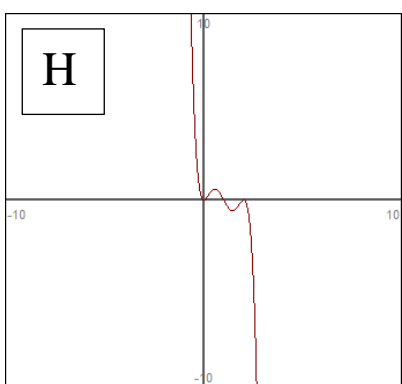
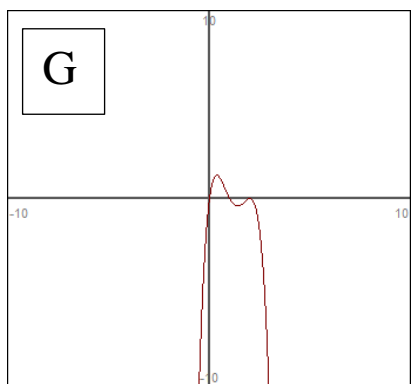
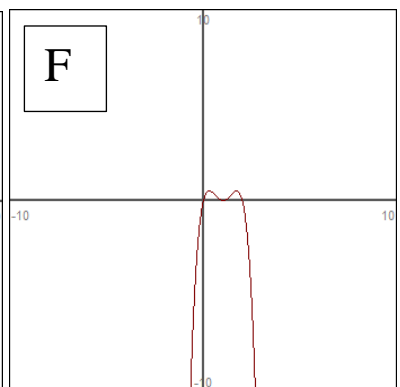
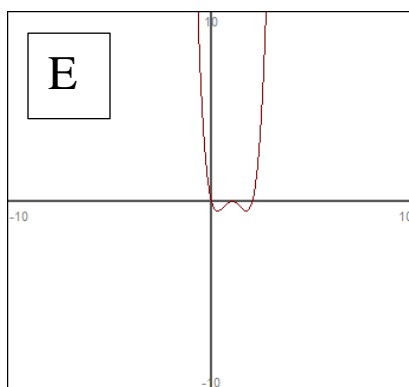
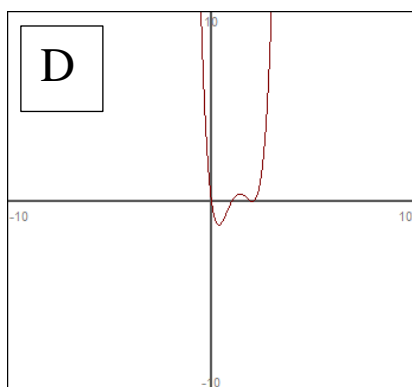
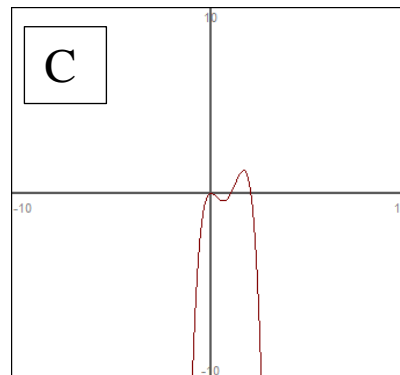
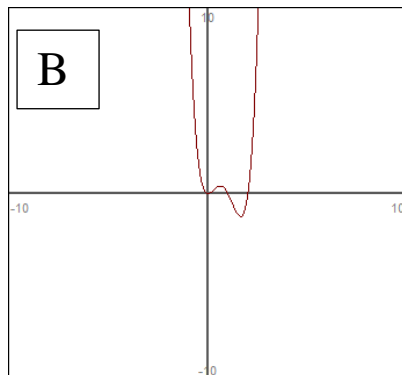
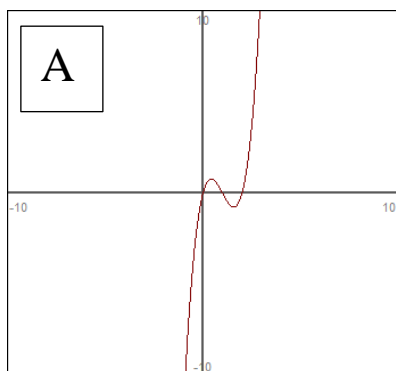
11. Solve:  $\sin x - \sin x \tan x = 0$  where  $0 \leq \theta < 2\pi$  [8]

[ 9 ] 12. Put the letter of the corresponding graph in the answer blank:

a)  $f(x) = -2x(x-1)(x-2)^2$  Letter of Graph Choice \_\_\_\_\_

b)  $f(x) = 2x(x-1)^2(x-2)$  Letter of Graph Choice \_\_\_\_\_

c)  $f(x) = -2x^2(x-1)(x-2)$  Letter of Graph Choice \_\_\_\_\_



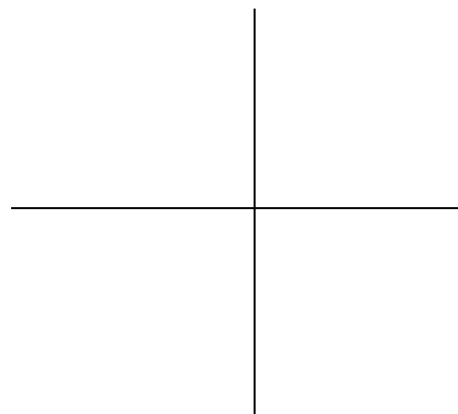
[21] 13. Graph. Fill in information. **Label the information on the graph, including dashing in asymptotes.**

a)  $y = -x^2 - 2x + 3$

Vertex (show work algebraically)

Zeros (show work algebraically)

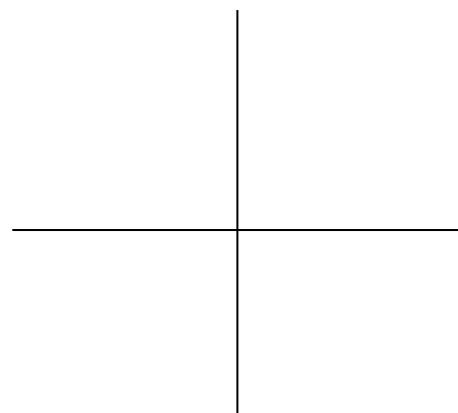
y-intercept:



b)  $y = -e^x + 3$

Equation of asymptote:

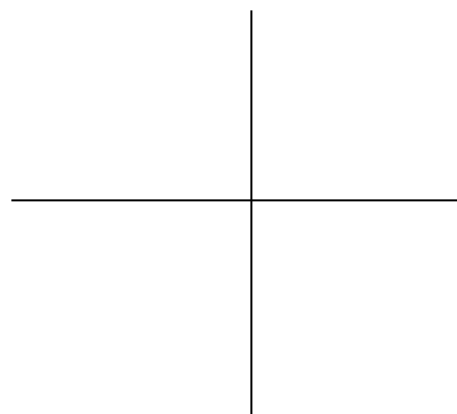
y-intercept:



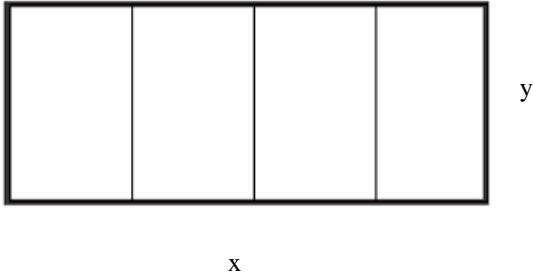
c)  $y = \ln(x - 4)$

Equation of asymptote:

x-intercept:



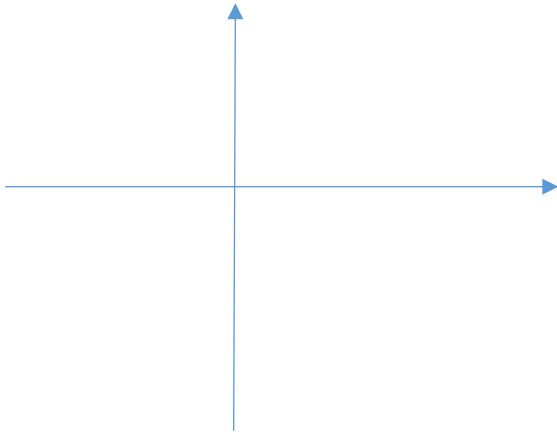
14. A dog breeder is building an enclosed region consisting of 4 rectangular areas. She has 2000 feet of fencing to enclose all borders of the rectangles. [8]



a) Write an equation for the total area in one variable, either  $x$  or  $y$ .

b) Use algebra to find the dimensions that give maximum area. Then find the area. Include units on answers.

[8] 15. Graph:  $f(x) = \begin{cases} 2, & x \leq -1 \\ -x + 3, & -1 < x \leq 3 \\ 10 - x^2, & x > 3 \end{cases}$  Mark endpoints open or closed.



16. Write the linear function,  $f(x)$ , if  $f(-1) = 7$  and  $f(2) = 5$  [8]

[16]17. Prove **any 2** of the following 3. **Check the two boxes of the problems you want graded.** Put reasons next to each step. If you don't check two boxes, the first two will be graded, regardless of work.

a)  $\frac{\sec^2 \theta}{\sec^2 \theta - 1} = \csc^2 \theta$

Grade?

☐

b)  $\frac{\cos^2 \theta}{1 + \sin \theta} = 1 - \sin \theta$

Grade?

☐

c)  $\frac{1}{1 - \sin x} - \frac{1}{1 + \sin x} = \frac{2 \tan x}{\cos x}$

Grade?

☐