

AP Calculus AB Summer Packet
 (Due the *2nd day* of class 2004-2005 school year)

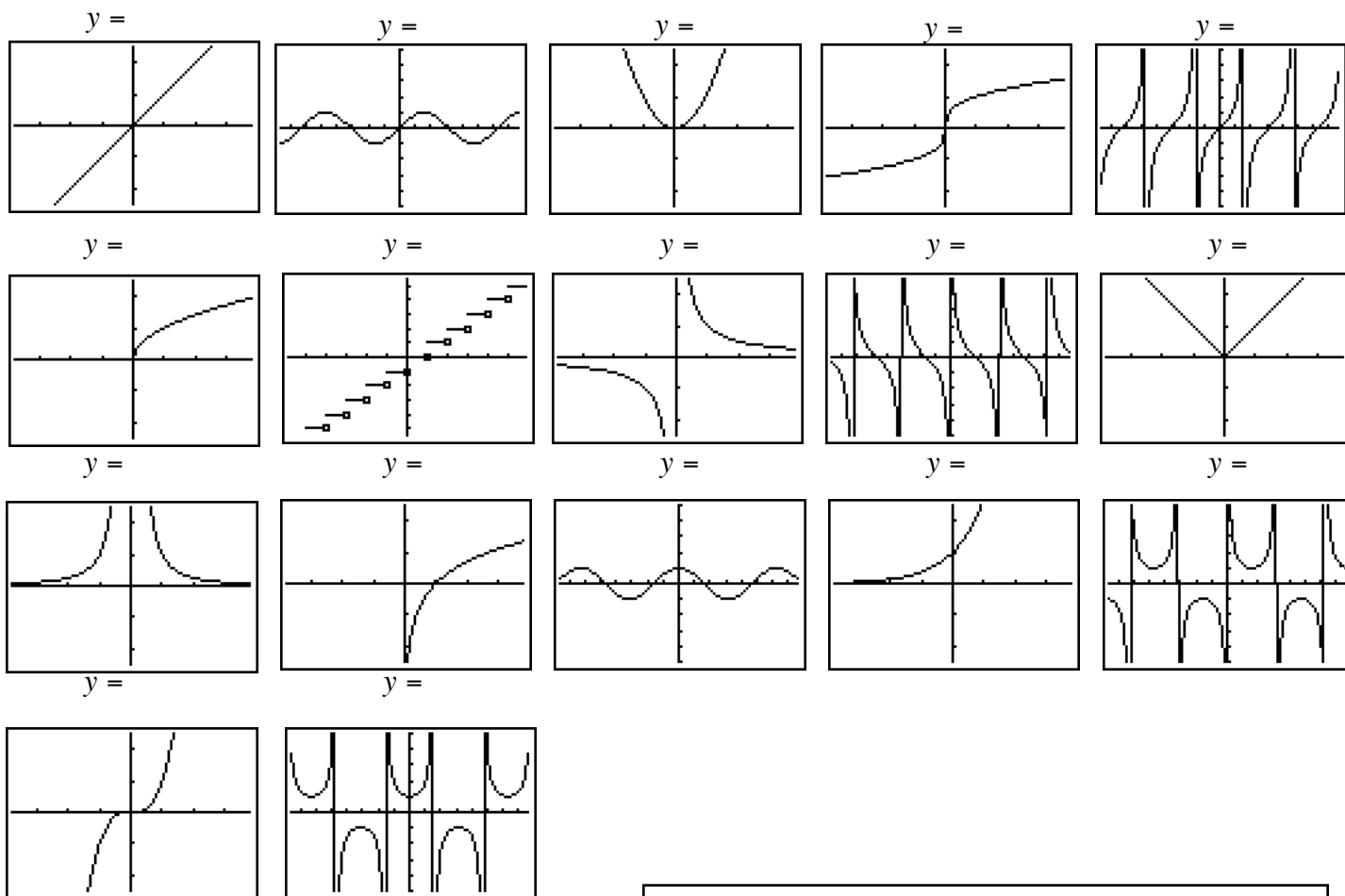
Name _____

****Round answers to the nearest .001 except where exact answers are required.****

The graphs of these functions will be used routinely in the course. Practice these graphs until you can demonstrate them from memory.

- | | | | |
|----------------|-------------------|---------------------|--------------|
| $y = x$ | $y = \sqrt[3]{x}$ | $y = e^x$ | $y = \cos x$ |
| $y = x^2$ | $y = \frac{1}{x}$ | $y = \frac{1}{x^2}$ | $y = \tan x$ |
| $y = x^3$ | $y = x $ | $y = [x]$ | $y = \cot x$ |
| $y = \sqrt{x}$ | $y = \ln x$ | $y = \sin x$ | $y = \sec x$ |
| | | | $y = \csc x$ |

1. Match each above equation with its graph below:



| Important Trig Identities | |
|----------------------------------|---------------------------------|
| $\sin^2 x + \cos^2 x = 1$ | $\sin 2x = 2 \sin x \cos x$ |
| $1 + \tan^2 x = \sec^2 x$ | $\cos 2x = \cos^2 x - \sin^2 x$ |
| $1 + \cot^2 x = \csc^2 x$ | |

2. Simplify:

a. $\frac{x^3 - 125}{x - 5}$

b. $\frac{|x|}{\sqrt{x^2}}$ (Hint: graph)

3. Write as a piecewise function:

a. $f(x) = 4|x - 3|$

$$f(x) = \begin{cases} \square & , x \geq 3 \\ \square & , x < 3 \end{cases}$$

b. Given $g(x) = x^2 + 3$, write the equation of the line through $g(2)$ and $g(3)$.c. Write the equation of the line that passes through the x-intercept of $2(3x - y) = 3$ and is normal to that line.

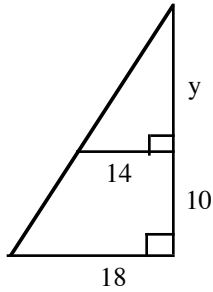
4. Solve for x.

a. $e^{2x} - 4e^x + 3 = 0$
[exact answer(s)]

b. $2 + \cos^2 x = 3 \sin^2 x$
 $0 \leq x < 2\pi$ [exact answer(s)]

c. $\ln(x + 4) + \ln(x - 4) = 9t$ (Solve for x as a function of t.)

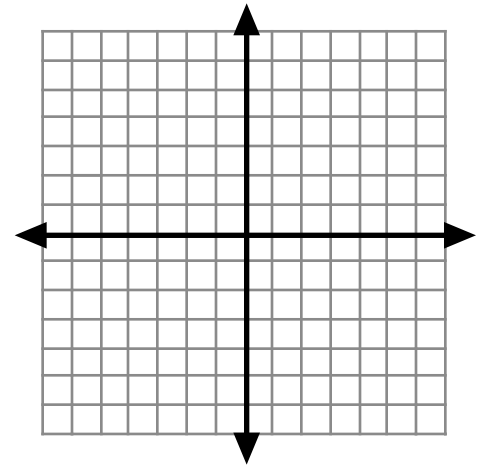
5. Find y in the figure:



6. Given $f(x) = x^3 + 1$, find

$$\frac{f(x+h) - f(x)}{h}$$

7. Graph $f(x) = 2 \cos x$ and $g(x) = \sqrt{x}$ on the same axes. Find the point(s) of intersection of $f(x)$ and $g(x)$. Round to 3 decimal places.



8. Find the domain and range for the following functions. Use Interval Notation.

a. $f(x) = \begin{cases} \sqrt{9 - x^2} & \text{if } 0 \leq x < 3 \\ e^x & \text{if } x < 0 \end{cases}$

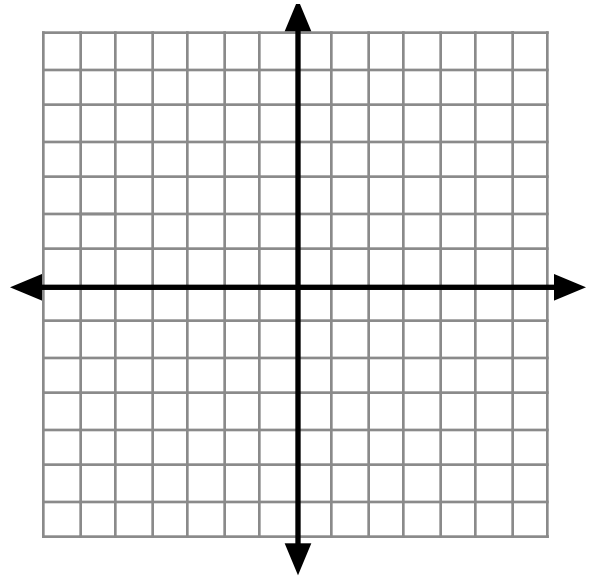
b. $f(x) = \frac{\sin x}{x}$ (Use your calculator)

c. $f(x) = \frac{x^2 + x - 12}{x - 3}$

d. $f(x) = \frac{\sqrt{4 - x^2}}{x - 3}$ (Use your calculator)

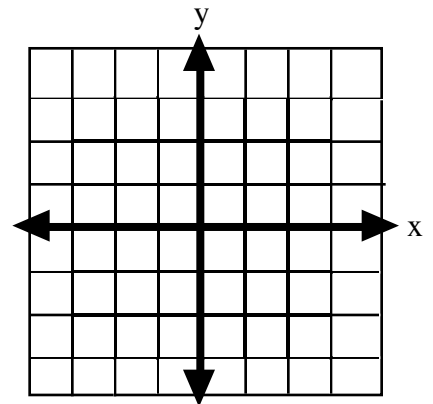
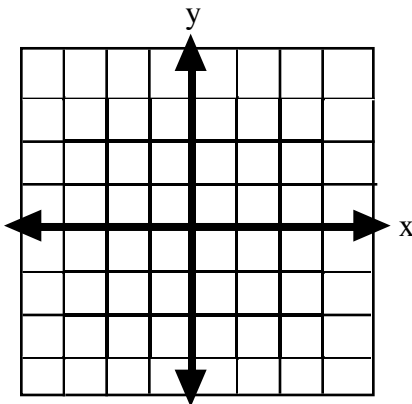
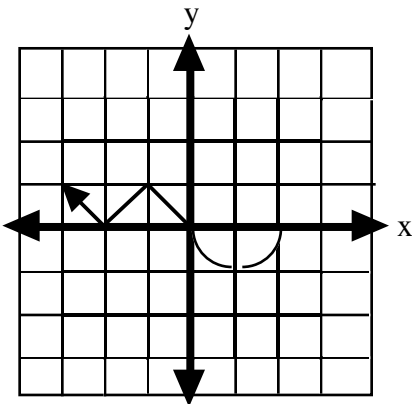
9. Given $f(x) = 4\sin\left(\frac{\pi}{2}x\right) + 2$

- Amplitude _____
- Period _____
- Graph one period.
- Write the equation of the line through the maximum point and minimum point of the period graphed.



10. Given the graph of $y = f(x)$ below: a. graph $y = -f(x)$

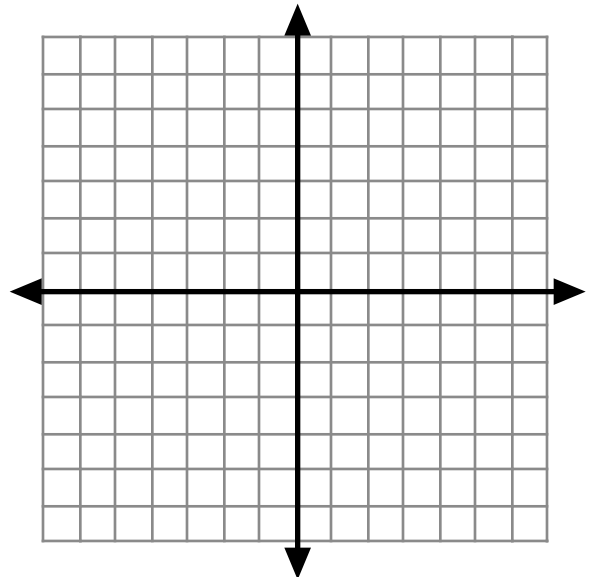
b. graph $y = f(-x)$



11. Given $y = \frac{2(x+3)(x-2)}{(x-3)(x+3)}$

Identify:

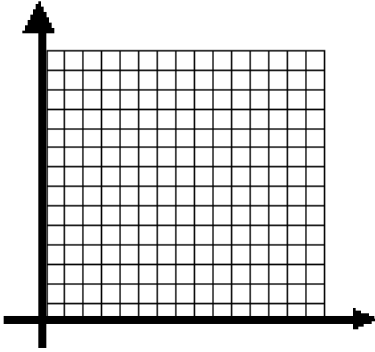
- any holes _____
- any vertical asymptotes _____
- any horizontal asymptotes _____
- x - intercepts _____
- y - intercepts _____
- Graph



12. Region R is the area bounded by the graphs of $y = \frac{2}{3}x + 2$, $y = 6$, and $x = 0$

a. Sketch region R

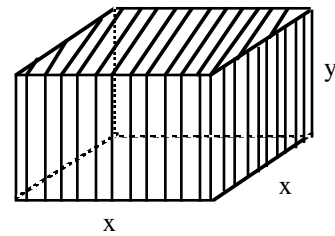
b. Find the area of region R.



c. If region R is revolved about the y-axis, what is the volume of the resulting solid?

d. Find the measure of the angle (nearest hundredth of a degree) formed by the y-axis and $y = \frac{2}{3}x + 2$.

13. A closed box with a square base of side (x) and height (y) has a surface area of 100 sq. ft.



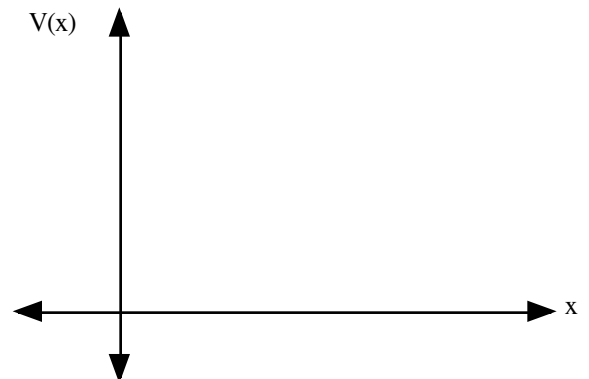
a. Express the volume of the box as a function of x . $V(x) =$

b. Sketch the graph of $V(x)$ to the right.

c. Domain of $V(x) =$ _____

Range of $V(x) =$ _____

d. Use a graphing calculator to find the lengths of sides (x & y) where the maximum volume is obtained. Also find the maximum volume.



$x =$ _____ $y =$ _____ Maximum volume = _____

14. $f(x)$ is represented by the following table of values.

| | | | | | | | |
|--------|--------|-------|-------|---|----|----|----|
| x | -6 | -4 | -2 | 0 | .2 | .4 | .6 |
| $f(x)$ | -1.416 | -.864 | -.408 | 0 | | | |

- a. If $f(x)$ is an even function, find $f(.4) =$ b. If $f(x)$ is an odd function, find $f(.6) =$

15. The time t (in seconds required to attain a speed of v miles per hour from a standing start for a 1999 Dodge Avenger is given in the table **Note: t is the independent variable (the x).**

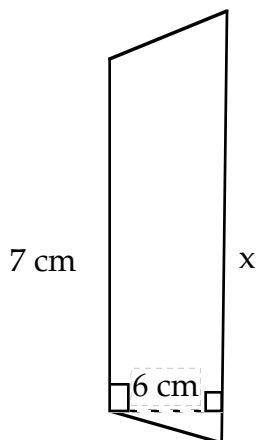
| | | | | | | | |
|-----|-----|-----|-----|-----|------|------|------|
| v | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| t | 3.4 | 5.0 | 7.0 | 9.3 | 12.0 | 15.8 | 20.0 |

- a. Use your graphing calculator to create a scatter plot of the data.
 b. Using your graphing calculator, create a quadratic regression equation for the data. (Round your coefficients to three decimal places when you write down your solution, however, paste the complete regression equation into your "y=".)

Regression Equation: _____

- c. Graph your regression equation and determine how fast will the car be moving at $t = 13$ seconds. (Record all answer to three decimal places) _____
 d. How fast will the car be moving at $t = 22$ seconds. _____
 e. Determine at what time in the interval from $t = 0$ to $t = 20$ seconds, the car attains 72 mph. _____
 f. Using the graph of your regression model, predict when the car will attain 105 mph.

16. The area of Trap is $30\sqrt{2} \text{ cm}^2$. Find the exact value of x .



17. At 8 am, the math dept. copier was making 100 copies per minute. Its counter read 274395. At 4 pm, the copier was only making 84 copies per minute (it gets tired) and the counter read 281999. Find the average number of copies made per minute from 8 am to 4 pm.