2017-2018 AP Calculus AB Summer Assignments

Dear future AP Calculus AB student –

Welcome to the wonderful world of AP Calculus! I would like to provide you with some information that will be helpful to you successfully completing AP Calculus AB during the upcoming school year. I highly recommend that you seriously consider and complete each of the following suggestions so that you can obtain a score of 3 or better on the AP Calculus exam.

******** AP Calculus AB Exam Date ******** Tuesday, May 15th, 2018 ********
**********We Start Preparing for Your 5 Now **********

I am pleased that you have chosen to continue your math sequence by enrolling in AP Calculus AB for next year. To help ensure your success in AP Calculus AB next year, I have created two summer assignments to help you find the most success in this course.

In the past, some AP Calculus AB students did not take the summer assignments serious and their grades suffered all semester long --- DO NOT MAKE THE SAME MISTAKE!!

What you need to be Successful in AP Calculus:

- Strong grasp of prerequisite knowledge from previous math courses
- Positive attitude
- Strong work ethic

Assignment #1

- Send Mr. Lavey (mlavey@d230.org) an email containing the following:
    - Introduce yourself to me. Tell me what clubs and/or sports you are involved in. If you work, inform me about your job. What do I need to know about you? Why did you signup to take AP Calculus AB?

Assignment #2

- The successful completion of this packet! This packet contains prerequisite materials from Honors Algebra and PreCalculus necessary to be successful in AP Calculus AB and is to be completed in the following manner:

- All answers must be circled in the packet itself with all necessary work shown.
- For your benefit, you should try and solve all problems WITHOUT a calculator first.
- Each problem must have WORK! **NO WORK! NO CREDIT!**
- **The packet with work is due on the first day of school: Thursday, August 17th, 2016.** NO EXCUSES will be accepted.
- **The packet is due whether or not you are physically present in school.** NO EXCUSES will be accepted.

Important Dates:

- August 14th – Summer Assignment #1 email sent to Mr. Lavey.
- August 17th – First Day of School – Summer Assignment #2 packet is Due (Turned In) in class.
- August 18th-24th – Question and Answer sessions on the packet. Be sure to write down all questions beforehand.
- August 25th – Test over Summer Packet and Chapter 1

Resources you may want to use:

- Your Honors Algebra, Geometry or PreCalculus notes.
- www.interactmath.com
- www.Mathforum.com
- www.khanacademy.com
- Practice the unit circle at: www.kwarp.com/portfolio/trigspinner.html

Section 1: Writing Linear Equations

- What is standard form? _____
- What is slope-intercept form? _____
- What is point-slope form? _____

Write the following equations. The problems should be done without the use of a calculator.

1. Write the equation of the line passing through the points (-3, -2) and (5, -1).

2. Write the equation of the line passing thru the points (5, -2) and (5, -8).

3. Write the equation of the line parallel to the line $3x + 2y = 6$ and passing through the point (4, 3).

4. Write the equation of the line perpendicular to the line $y = -2x + 3$ and passing through the point (-6, 2).

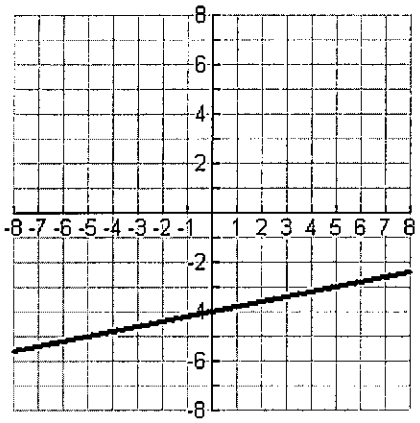
5. Write the equation of the line perpendicular to the line $3x - 2y = -8$ and passing thru the point (-2, 1).

6. Write the equation of a circle whose endpoints of a diameter are (-3, 4) and (3, -4).

7. Write the equation of a polynomial function which has the given zeros: double root of 0, -1, 5

8. Write an equation for a) the vertical line and b) the horizontal line through point P(-3,5).

9. Write the equation of the line shown in the following graph.



Section 2: Simplifying Algebraic Expressions

The following problems should be done without the use of a calculator.

Perform the indicated operations. Simplify all answers.

1. $3(x-4)^2(2x)+2(4x-3)x$

2. $(2p + 5q)^2$

3. $(x^3a^j)^m$

4. $(-2d^n)^5$

5. $2^3 \cdot 2^m$

6. $\left(a^k+3\right)\left(a^k-2\right)$

7. $(5m^2 - 2mp - 6p^2)$ - $(-3m^2 + 5mp + p^2)$

8. $\left(-2x^3+3x^2y-2xy^2+y^3\right)+\left(8x^3-5x^2y+2y^2x-2y^3\right)$

9. $x^{\frac{5}{8}}\left(x^{\frac{3}{8}}-10x^{\frac{11}{8}}\right)$

10. $\dfrac{x-3}{x+4}+\dfrac{x}{x-2}$

11. $\dfrac{3}{2n+1}+\dfrac{n+1}{4n^2-1}$

12. $\dfrac{x^2-x-6}{x^2-3x-10}$

13. $\dfrac{x^2-9}{x^2-5x+6} \div \dfrac{x^2+5x+6}{x^2-4}$

14. $\dfrac{x^2+5x+4}{x^2+2x+1} \div \dfrac{2x+2}{x+4}$

15. $\dfrac{\frac{1}{2}+\frac{3}{x}}{\frac{x}{4}}$

16. $\left(\dfrac{2g^2}{h}\right)^3 \cdot \dfrac{5}{6hg^4}$

17. $\left(x^{\frac{2}{3}}-3\right)\left(x^{\frac{2}{3}}+2\right)$

18. $\left(\dfrac{2x^2+11x-21}{x^3+2x^2+4x}\right)\left(\dfrac{x^3-8}{x^2+5x-14}\right)$

19. $\dfrac{\frac{x+h}{x+h+2}-\frac{x}{x+2}}{h}$

20. $\dfrac{\frac{1}{(x+h)^2}-\frac{1}{x^2}}{h}$

Simplify by writing as one fraction with positive exponents:

21. $2r^3-100r^{-1}$

22. $2(4x-2)^{-2}(3x)-3(4x-2)^{-1}(x-3)$

Section 3: Factoring Algebraic Expressions

Factor each of the following completely.

1. $x^{4n} - 9$

2. $a^3 - 27$

3. $4x^2 - 13x + 9$

4. $2a^2 + 10a + 12$

5. $80x^3 + 10x^2 - 15x$

6. $m^4 - 1$

7. $16a^3 + 54$

8. $8x^2 + 12xy - 80y^2$

9. $2x^3 + 8x^2 - 8x - 32$

10. $r^3 + 3r^2 - 54r$

11. $4a^2 + 12ab + 9b^2 - 25c^2$

12. $2(5x+1)^2 - 18$

Section 4: Rational Expressions

Find the domain of the following functions. You may not use a calculator.

1) $f(x)=\dfrac{1}{x+2}$

2) $f(x)=\dfrac{x}{x^2-9}$

3) $f(x)=\dfrac{x-1}{x^2-x-6}$

4) $f(x)=\dfrac{3x^2}{x^2+1}$

Section 5: Log Properties

Expand using log properties:

1) $\ln\left(x^2\sqrt{y}\right)$

2) $\log_3\left(\dfrac{x+3}{x^2}\right)$

3) $\log\left(\dfrac{x(x-4)^2}{3y}\right)$

4) $\ln\left(\dfrac{4}{3}\right)+\ln\left(\sqrt[3]{x^2}\right)$

Section 6: Solving Equations

Solve the following equations. Give exact answers, not decimals.

1) $1-10e^{2x}=-49$

2) $2+\cos^2 x=3\sin^2 x,\ 0\le x\le 2\pi$

3) $\ln(x+3)=4$

4) $\dfrac{2}{x+3}+x=\dfrac{4x+14}{x+3}$

5) $7x^2-3x=0$

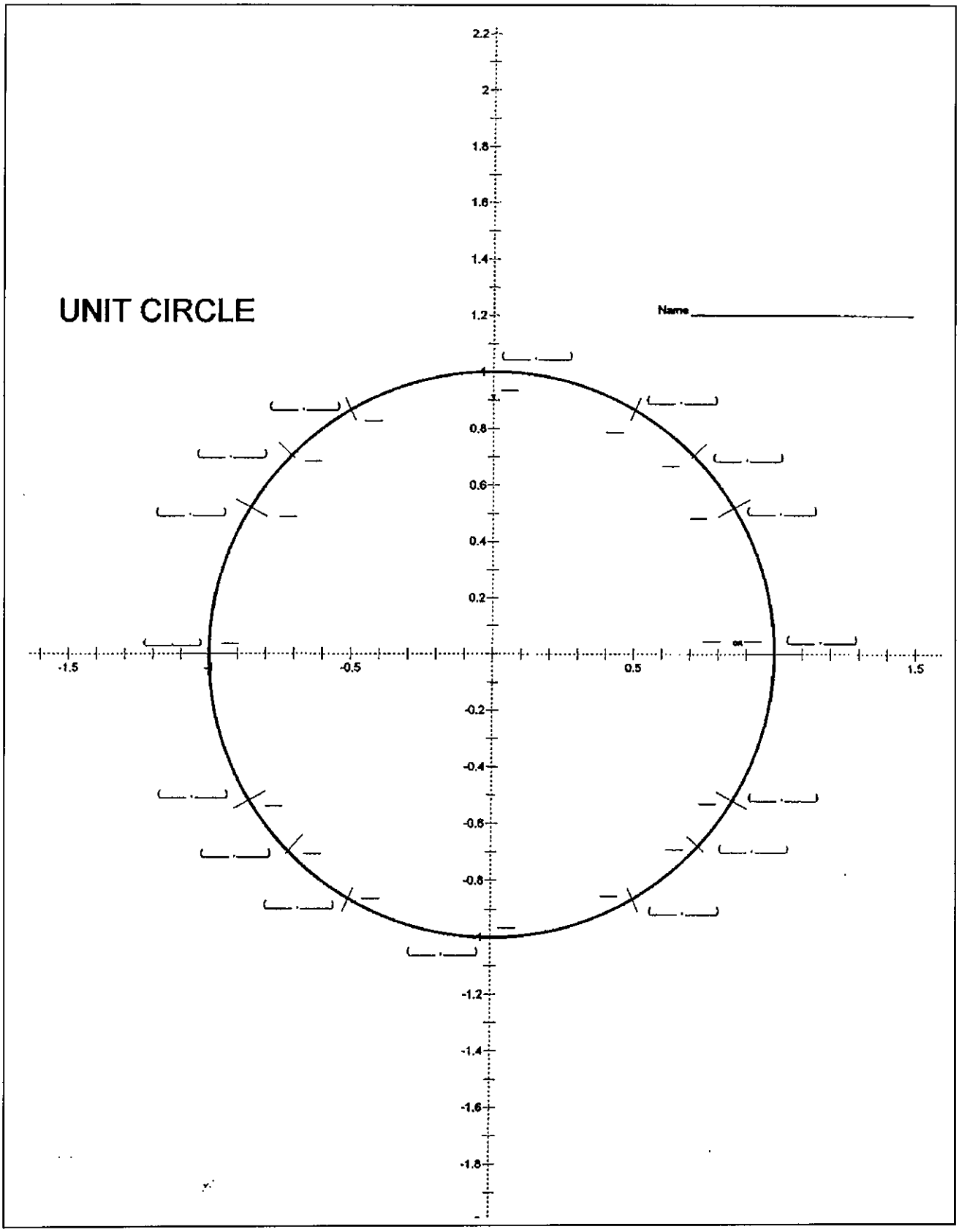
6) $4x(x-2)-5x(x-1)=2$

7) $x-10\sqrt{x}+9=0$

8) $\dfrac{1}{x^2}-\dfrac{1}{x}=6$

Section 7: The Unit Circle

Fill in the values in radians.



Section 7: The Unit Circle (continued)

Evaluate the following. You may not use your calculator.

1. $\sin\frac{\pi}{4}$ = _____ 2. $\cos\pi$ = _____ 3. $\tan(2\pi)$ = _____

4. $\sec\frac{\pi}{3}$ = _____ 5. $\cos(-\frac{\pi}{4})$ = _____ 6. $\csc\frac{\pi}{6}$ = _____

7. $\tan\frac{7\pi}{4}$ = _____ 8. $\sin(-\frac{3\pi}{4})$ = _____ 9. $\cot\frac{3\pi}{4}$ = _____

10. $\sec\frac{\pi}{2}$ = _____ 11. $\tan(-\pi)$ = _____ 12. $\sin\frac{11\pi}{6}$ = _____

13. $\cos\frac{5\pi}{3}$ = _____ 14. $\tan\frac{2\pi}{3}$ = _____ 15. $\cot\frac{5\pi}{4}$ = _____

16. $\csc\frac{3\pi}{2}$ = _____ 17. $\cos(-\frac{\pi}{2})$ = _____ 18. $\cos\frac{\pi}{4}$ = _____

19. $\sin\frac{\pi}{6}$ = _____ 20. $\cot\pi$ = _____ 21. $\sin(5\pi)$ = _____

22. $\sin\left(\frac{9\pi}{4}\right)$ = _____ 23. $\cos(-10\pi)$ = _____ 24. $\tan\left(\frac{15\pi}{4}\right)$ = _____

25. $\cos(-\frac{7\pi}{2})$ = _____

Section 8: Solving Trigonometric Equations

Solve the following equations on the interval $[0, 2\pi)$:

1) $\sin x = \frac{1}{2}$

2) $\cos^2 x = \cos x$

3) $2\cos x + \sqrt{3} = 0$

4) $4\sin^2 x = 1$

5) $2\sin^2 x + \sin x = 1$

6) $2\sin x \cos x + \sin x = 0$

7) $8\cos^2 x - 2\cos x = 1$

8) $\sin^2 x - \cos^2 x = 0$

Section 9: Asymptotes and Removable Discontinuities

For each function, find the equations of the vertical asymptote(s) and/or horizontal asymptote(s), if they exist. Identify the ordered pair(s) of any removable discontinuities (holes) as well.

1) $y = \frac{x}{x-3}$

Vertical asymptote: _____

Horizontal asymptote: _____

Hole: _____

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

Vertical asymptote: _____

Horizontal asymptote: _____

Hole: _____

3) $y = \frac{x+2}{x^2-4}$

Vertical asymptote: _____

Horizontal asymptote: _____

Hole: _____

4) $y = \frac{x^2-2x+1}{x^2-3x-4}$

Vertical asymptote: _____

Horizontal asymptote: _____

Hole: _____

5) $y = \frac{x^2-9}{x^3+3x^2-18x}$

Vertical asymptote: _____

Horizontal asymptote: _____

Hole: _____

6) $y = \frac{2x^3}{x^3-1}$

Vertical asymptote: _____

Horizontal asymptote: _____

Hole: _____

7) $y = \dfrac{x^2 - x - 6}{x^3 - x^2 + x - 6}$

Vertical asymptote: _____

Horizontal asymptote: _____

Hole: _____

8) $f(x) = \dfrac{2x^2 + x - 2}{x^2 - 1}$

Vertical asymptote: _____

Horizontal asymptote: _____

Hole: _____

9) Given:

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

(You may not use your calculator.)

Identify:

a) Holes: _____

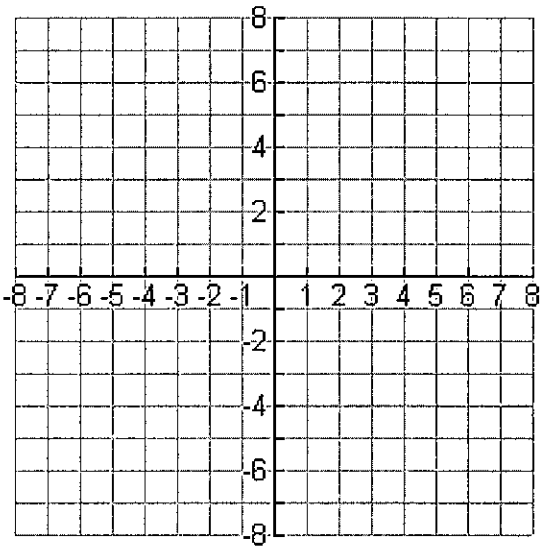
b) Vertical asymptotes: _____

c) Horizontal asymptotes: _____

d) x-intercepts: _____

e) y-intercepts: _____

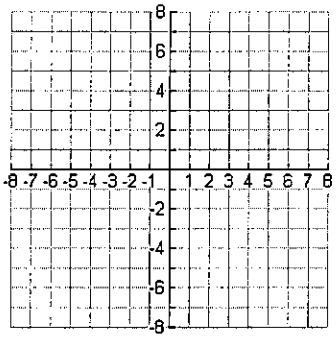
f) Sketch the graph.



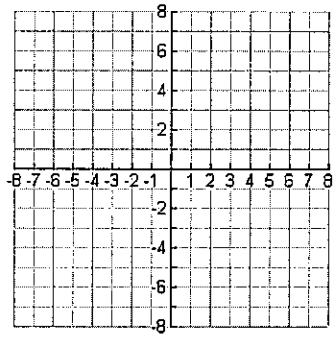
Section 10: Function Families

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

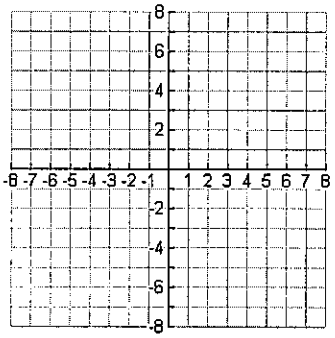
1) $y = x$



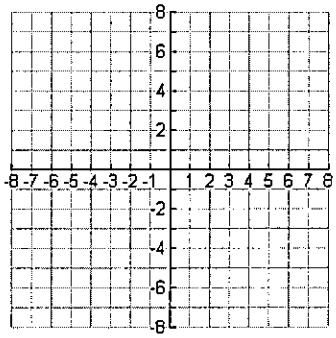
2) $y = e^x$



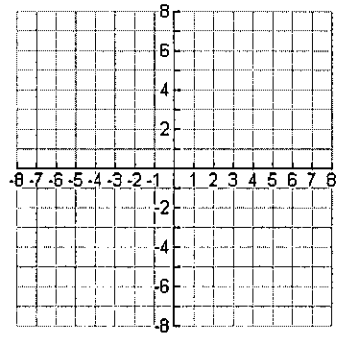
3) $y = x^2$



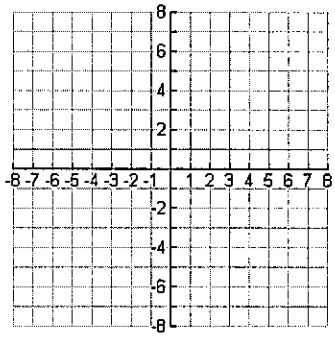
4) $y = \ln x$



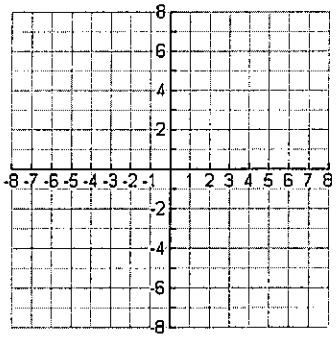
5) $y = |x|$



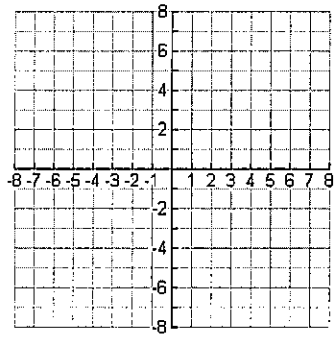
6) $y = \sqrt{x}$



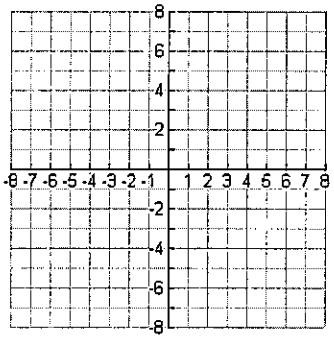
7) $y = \sqrt{9 - x^2}$



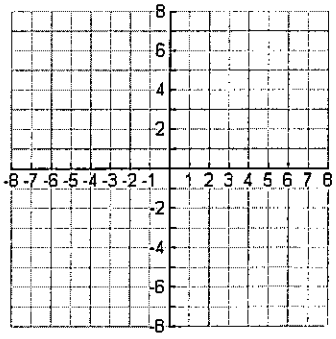
8) $y = \frac{1}{x}$



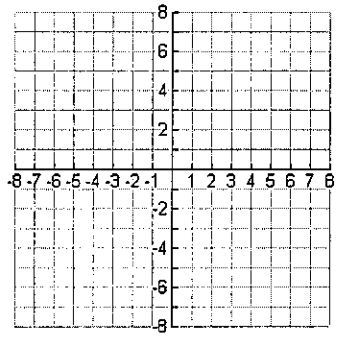
9) $y = \frac{1}{x^2}$



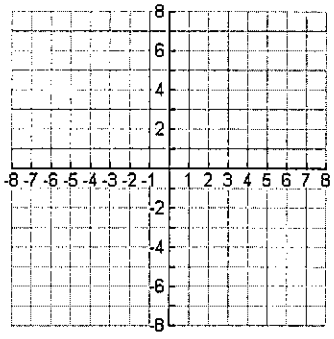
10) $y = \sin x$



11) $y = \cos x$

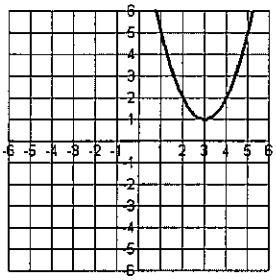


12) $y = \sec x$

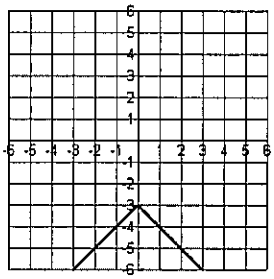


13) For the following graphs, write the equation associated with the graph. Use the ideas of translations, stretching, shrinking, and reflections to help you write each equation.

a.



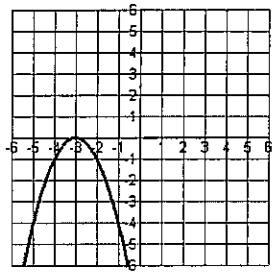
b.



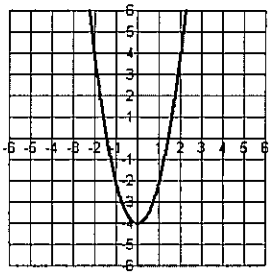
a. _____

b. _____

c.



d.



c. _____

d. _____

Section 11: Function Transformation

If $f(x)=x^2-1$, describe in words what the following would do to the graph of $f(x)$:

1) $f(x)-4$

2) $f(x-4)$

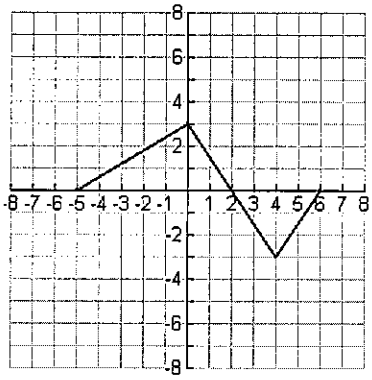
3) $-f(x+2)$

4) $5f(x)+3$

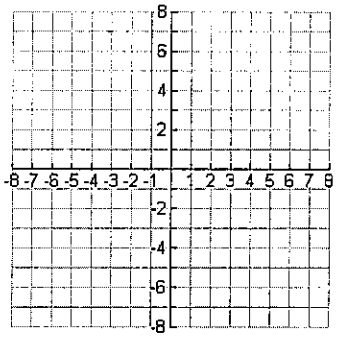
5) $4-f(x)$

6) $|f(x)|$

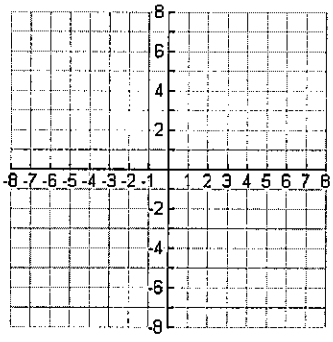
Here is a graph of $y=f(x)$. Sketch the following graphs:



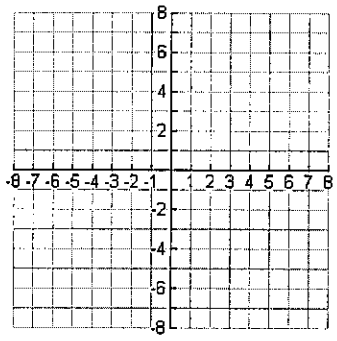
7) $y=2f(x)$



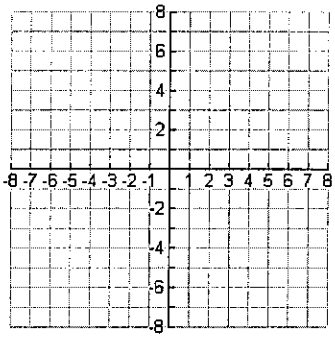
8) $y=-f(x)$



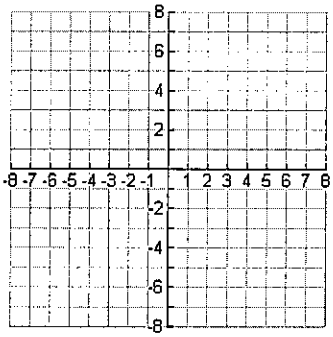
9) $y=f(x-1)$



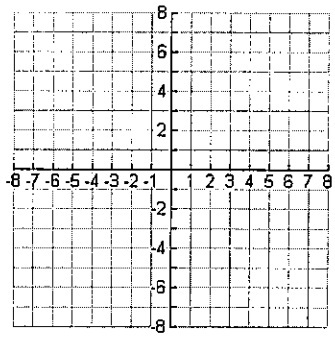
10) $y=f(x+2)$



11) $y=|f(x)|$



12) $y=f|x|$



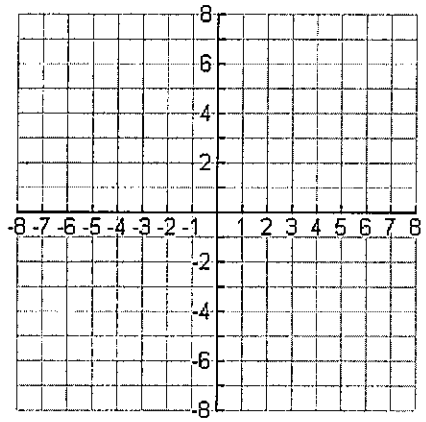
Section 12: Piecewise Functions

1) Let $f(x)=\begin{cases}2x^2 & when\ x<0\\ 3x & when\ 0\le x\le 1\\ |6-x| & when\ x>1\end{cases}$

Find $f(-3)+f(1)$

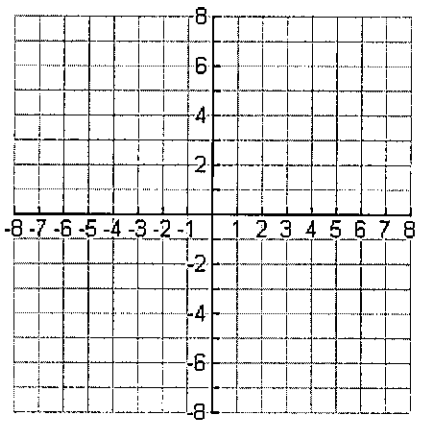
2) Graph the piecewise function:

$$f(x)=\begin{cases}x+1 & when\quad x>2\\ -2x+5 & when\quad x\le 2\end{cases}$$



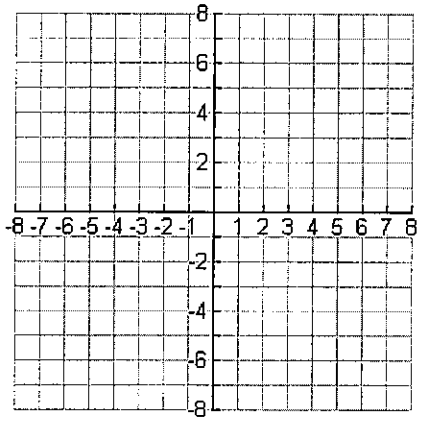
3) Graph the piecewise function:

$$f(x)=\begin{cases}3-x, & x\le 1\\ 2x, & 1<x\end{cases}$$



4) Graph the piecewise function:

$$f(x)=\begin{cases}x^2, & x<0\\ x^3, & 0\le x\le 1\\ 2x-1, & x>1\end{cases}$$



Section 13: Composition of Functions

Given $f(x)=3x-5$ and $g(x)=2(x-4)^2+2x$, calculate the following:

1) $g(f(x))$ 2) $f(g(3))$ 3) $f^{-1}(x)$

Given $f(x)=x^2$, $g(x)=2x-1$, and $h(x)=2^x$, find the following:

4) $f(g(2))$ 5) $f(h(-1))$ 6) $h(f(-1))$

7) $f(g(x))$ 8) $g(f(x))$ 9) $g(g(x))$

Given $f(x)=x^3+1$, $g(x)=3x^2-3$, and $h(x)=2x-5$, find the following:

10) $\dfrac{f(x+h)-f(x)}{h}$ 11) $\dfrac{g(x+h)-g(x)}{h}$

12) $g(h(x))$ 13) $h(g(1))$

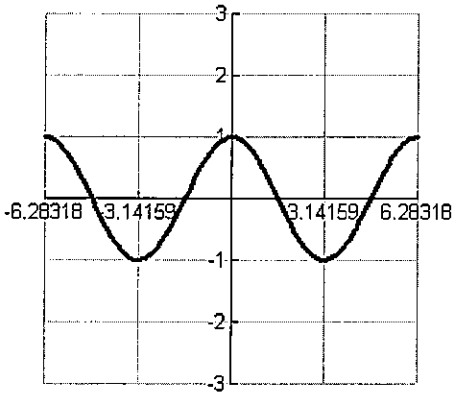
Section 14: Basic Trig Function Graphs

Match the following graphs with a trig equation.

A. $y = \sin x$ B. $y = \cos x$ C. $y = -2 \cos x$ D. $y = \tan x$ E. $3 \sin(x) - 1$

F. $y = -3 \sin x$ G. $y = \csc x$ H. $y = 3 \cot x$ J. $y = \sin(2x)$ K. $y = 3 \cos(x) -$

1.



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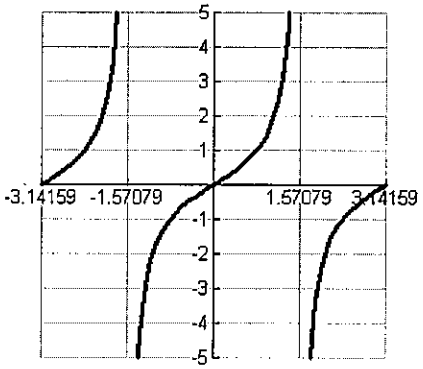

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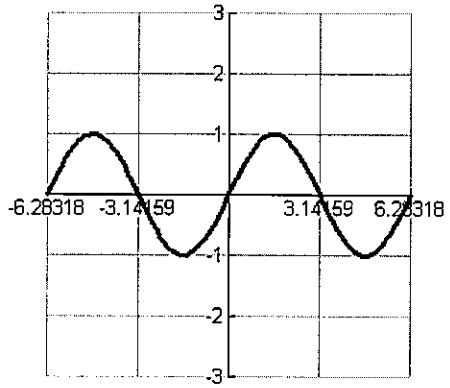

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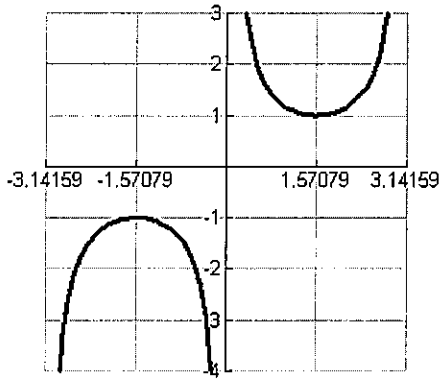

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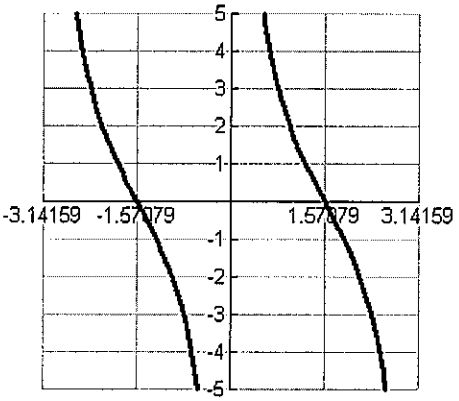

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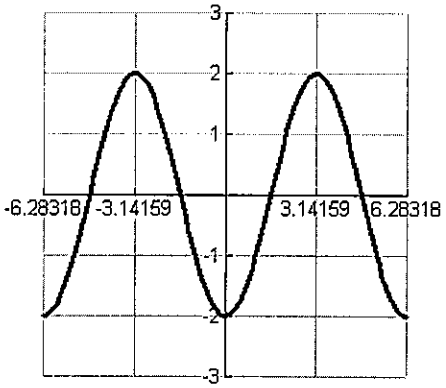

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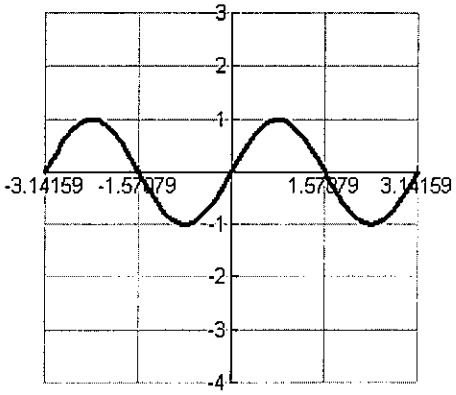

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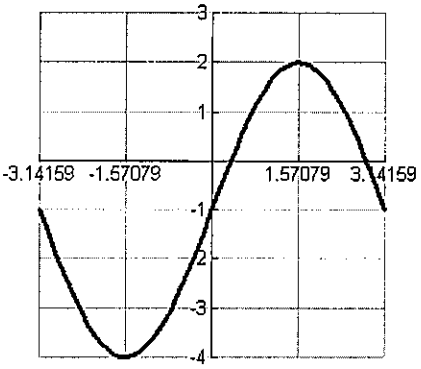

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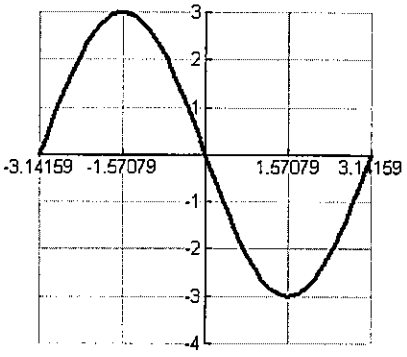
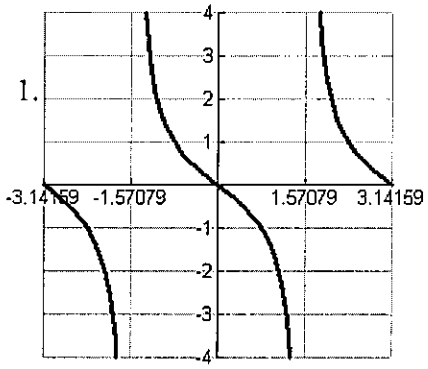


A. $y = \sin(x) - 3$ B. $y = \sin\left(x - \frac{\pi}{2}\right)$ C. $y = \sin(2x) + 3$

D. $y = \sec x$ E. $y = -\tan x$ F. $y = \sin \pi x + 3$ G. $y = \sin \pi x$

1.



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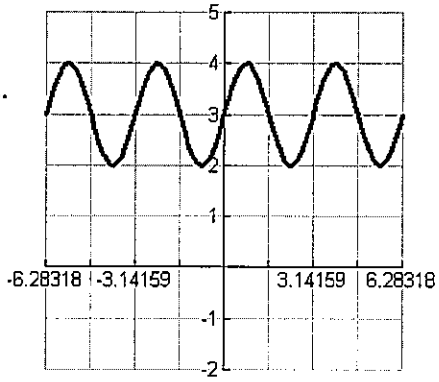

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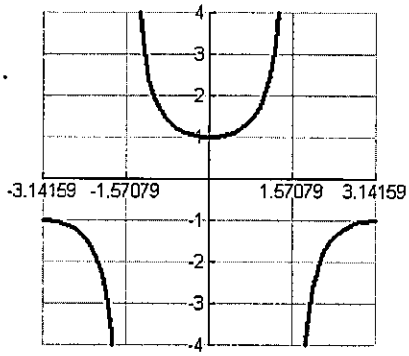

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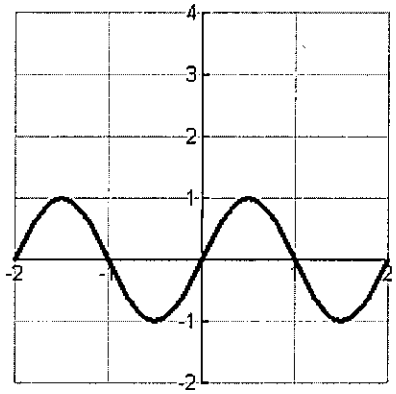

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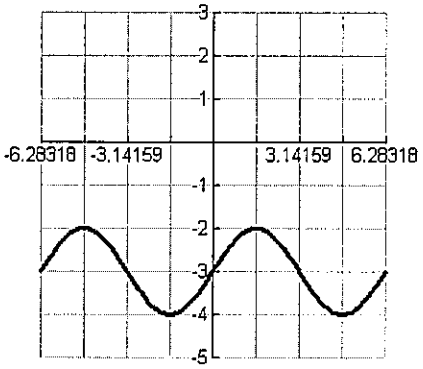

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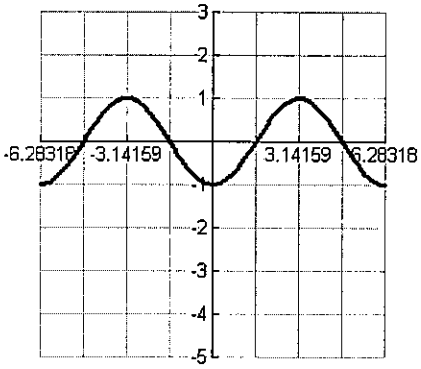

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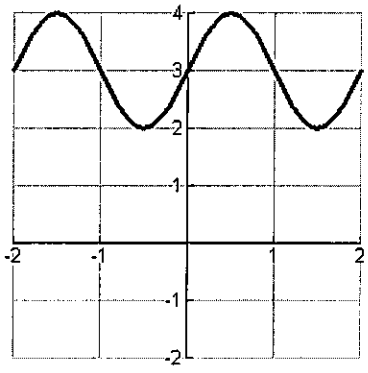
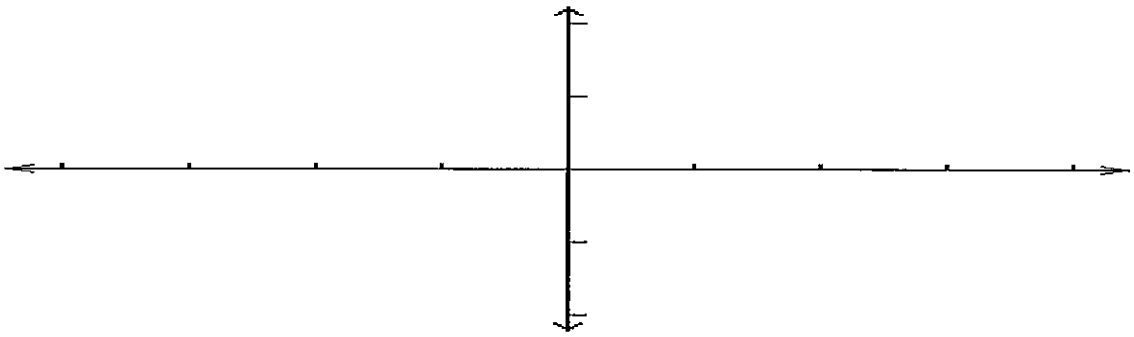


Section 15: Graphing Trig Functions

Graph one period of each trig function. (You may not use your calculator.)
Label each axis. Give amplitude, period, vertical shift, and phase shift for each equation. If none, write none.

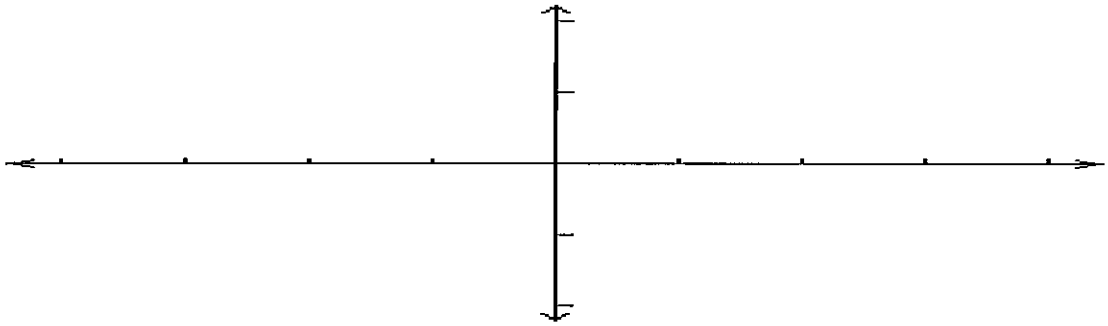
1. $y = -2 \sin(3x)$

Amp = _____ Period = _____ V.S. _____ P.S. _____



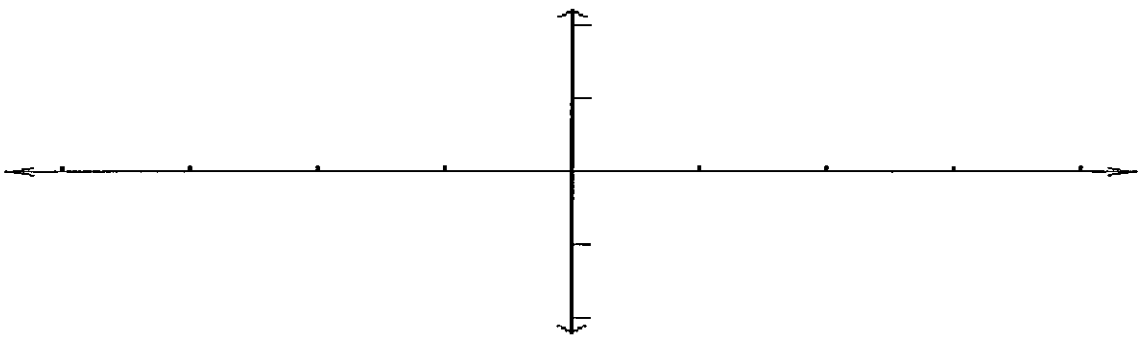
2. $y = \cos(2\pi x)$

Amp = _____ Period = _____ V.S. _____ P.S. _____



3. $y = -\cos x - 1$

Amp = _____ Period = _____ V.S. _____ P.S. _____



Section 16: Solving Exponential and Logarithmic Equations

Solve each equation. Show all work. You may use a calculator.

1) $5^{x-1} = 25^{2x-7}$

2) $3 + 4(2)^x = 53$

3) $\log_3 x = 4$

4) $\log_6(5-3a) = \log_6(a^2-5)$

5) $\log_2(x-4) - \log_2(x+2) = \log_2 20$

6) $\log_2(x-4) = 5 + \log_2(x+2)$

7) $2\log_5 6 - \frac{1}{3}\log_5 27 = \log_5 x$

8) $\log(x+1) + \log(x-1) = 2$

9) $2\ln(x-3) + 4 = 10$

10) $2 - 3e^{4-x} = -22$