AP Calculus
Summer Packet

- This packet is designed to help you retain the information you learned in Algebra 1, Algebra 2 and Pre-Calculus.
- The packet can be obtained on the math department website at **shsmath.webnode.com.** Go to the summer packet tab and then print out the packet for the class(es) you are taking next year.
- The packet will be ***due the <u>First Tuesday</u> of school.***
- **Please place all answers on the answer sheet and attach all work on separate paper to the answer sheet. If no work is shown, no credit will be given.**
- Here are some online resources you can use to help you if you are having trouble. There are also many others you can find using a Google search.

      1. **Khan Academy**
      2. **Youtube videos**

In preparation for this class, we recommend you arrive on the first day of class with the following supplies:
- 1 ½" or 2" – 3 ring binder
- Loose leaf paper or notebook
- Dividers for your binder
- Pencils
- TI-84 plus graphing calculator

Name:	AP Calculus Summer Packet Answer Sheet
Problem Set 1	**Problem Set 2**
1.	1.
2.	2.
3.	3.
4.	4.
Domain	5.
Range	6.
5A.	7.
5B.	8A.
5C.	
6A.	

8A.

6A.

8B.

9.
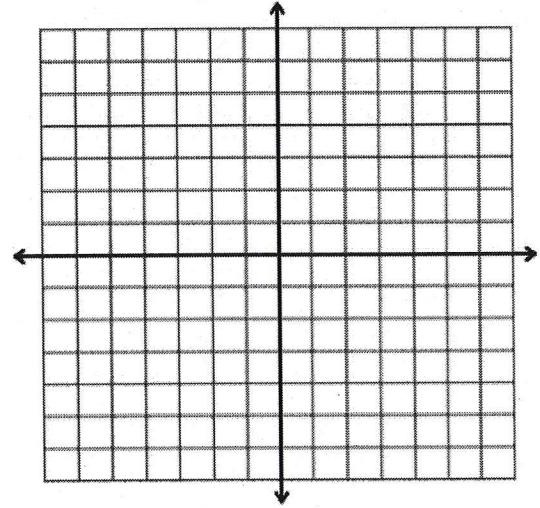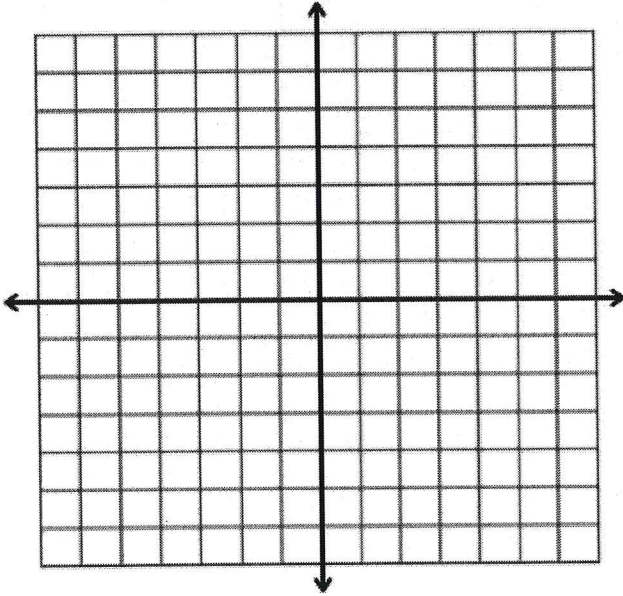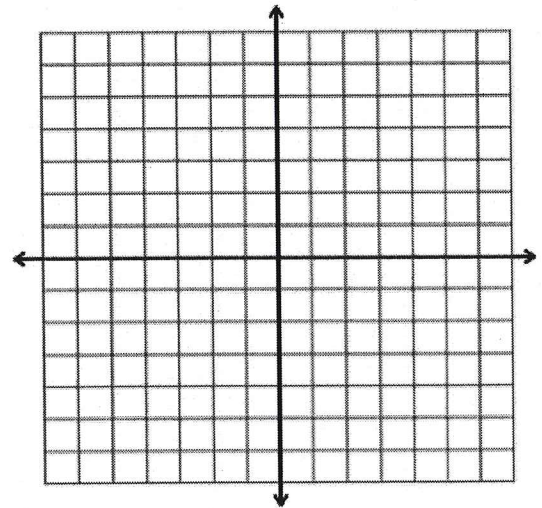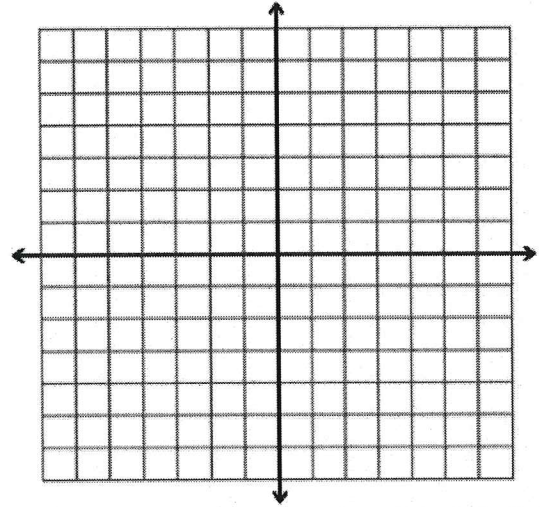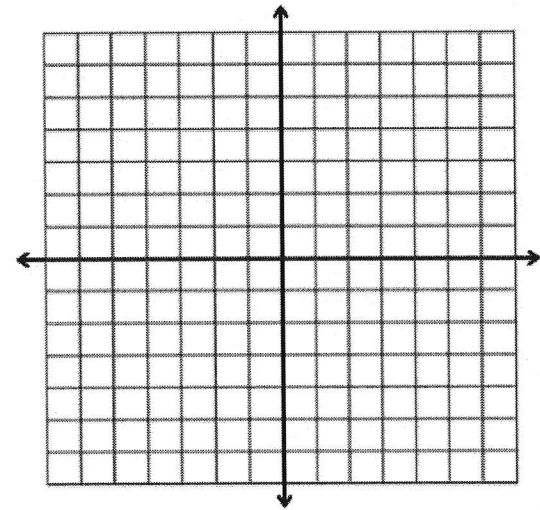
Problem Set 3	Problem Set 4
1A.	1A.
1B.	
1C.	
1D.	
2A.	
2B.	
2C.	
3.	1B.
4A.	
4B.	
5.	
6.	1C.
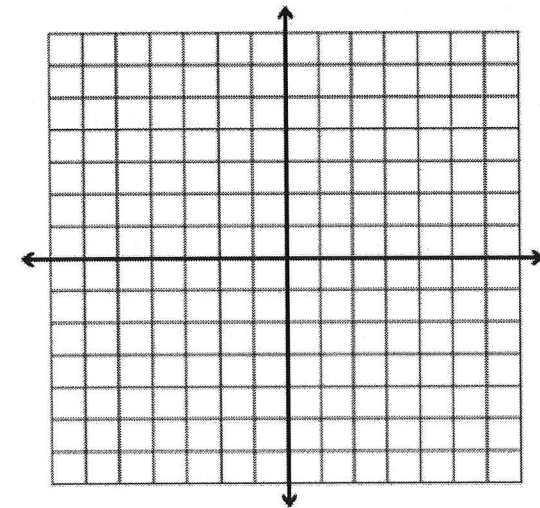
Problem Set 4 continued:

1D.

1E.

2.

3A.
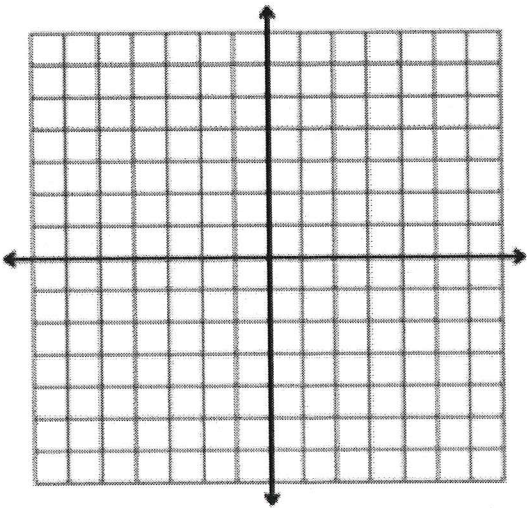
3A.
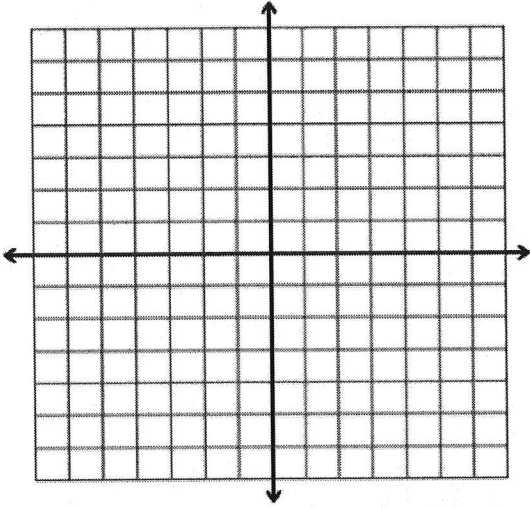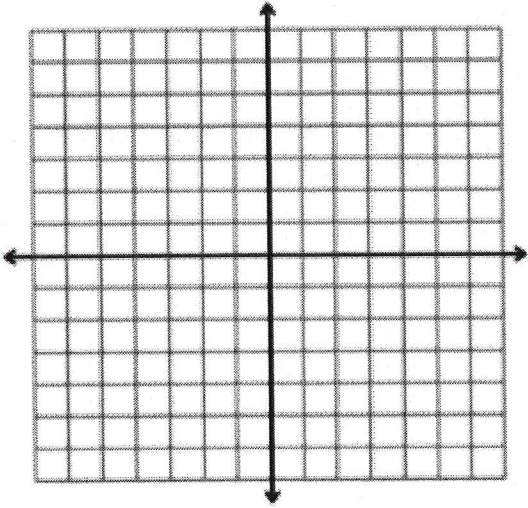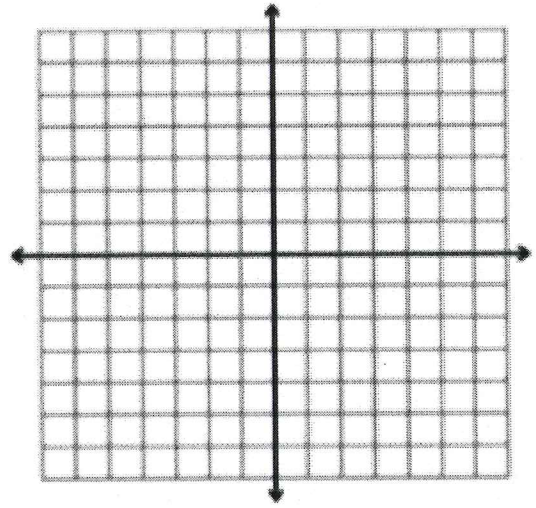
3B..

3C.

Problem Set 4 continued:

3D.

3E.
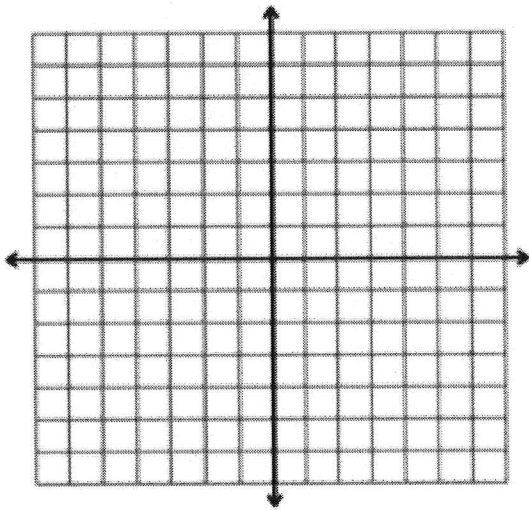
3F.
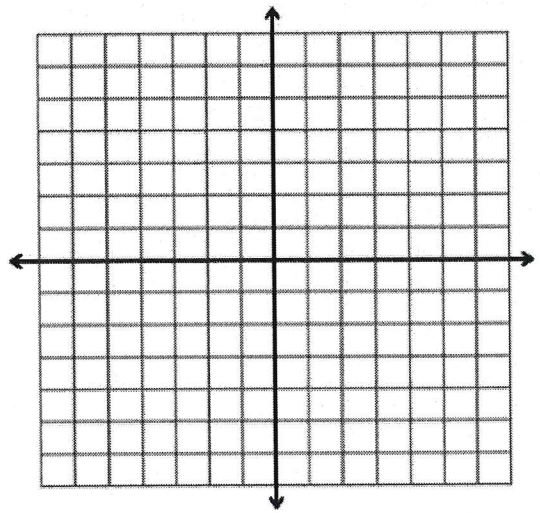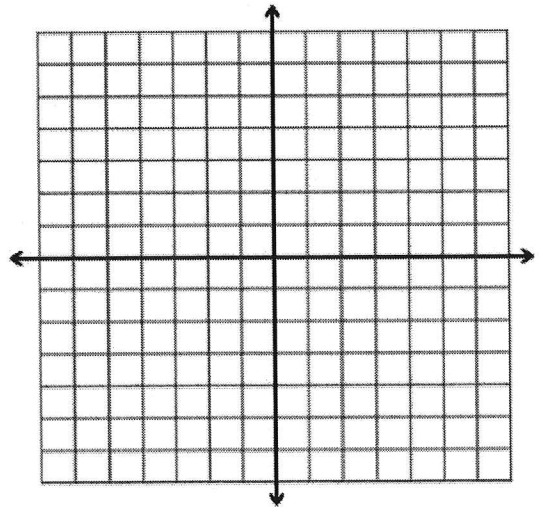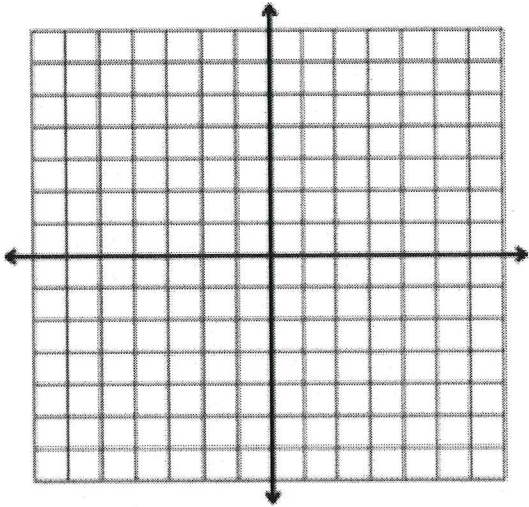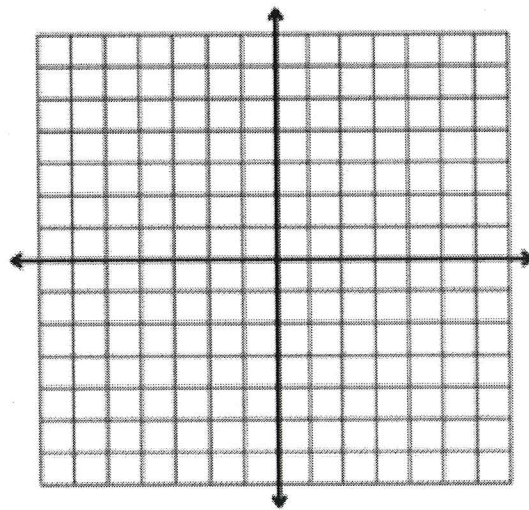
3G.
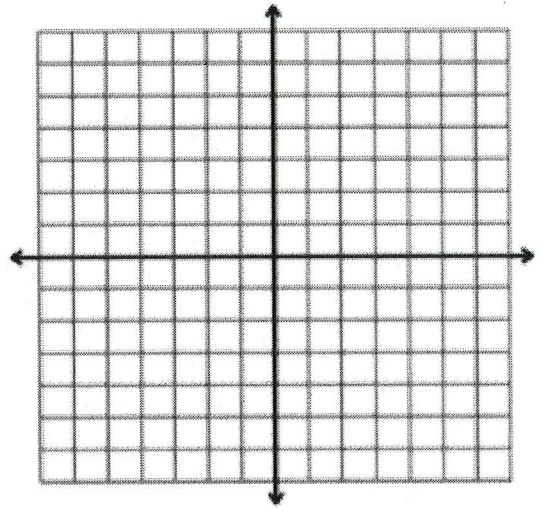
4A.
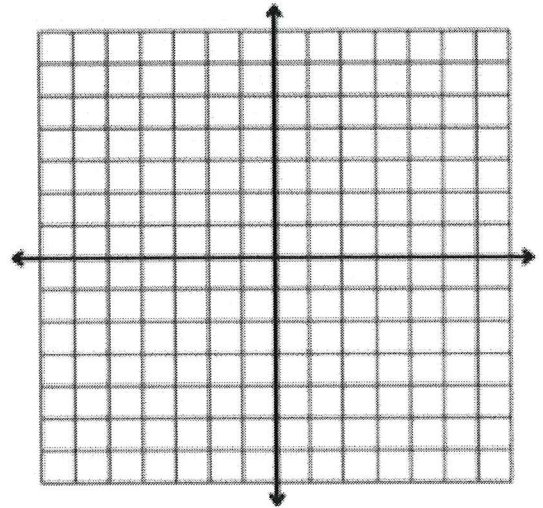
Challenge Exam for the Precalculus

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

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15. _____

16. _____

17. _____

18. _____

19. _____

20A.

20B.
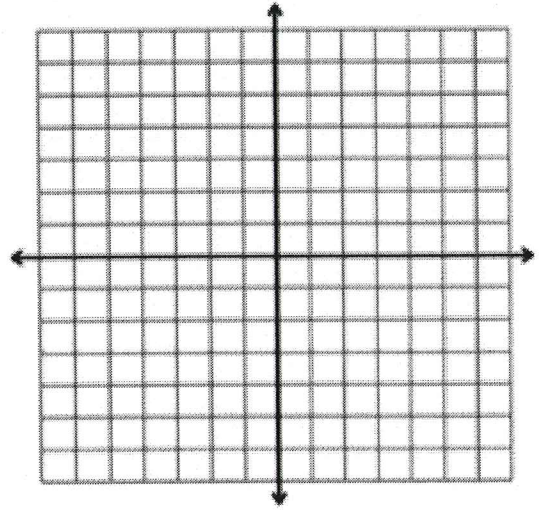
20C.
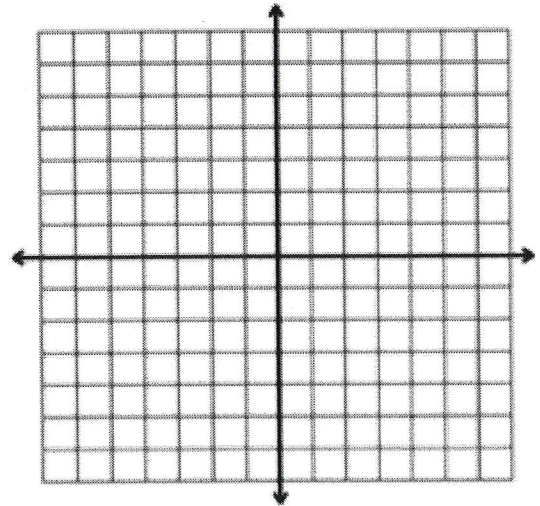
21. _____

22. _____

23A.

Challenge Exam for the Precalculus

23B.

24.

25. Domain

25. Range

26.

27.

28.

29.

30 Range

30 Domain

30 X-intercept

PROBLEM SET 1

You may use a graphing calculator on problems 3 through 6.

1. Which of the following relations are functions?

(a)

(b)

(c)
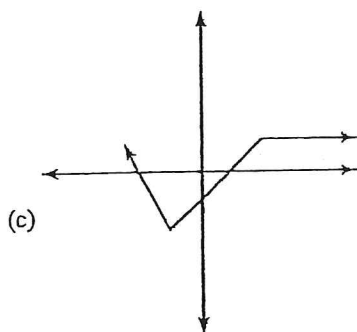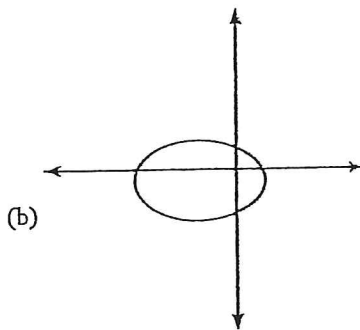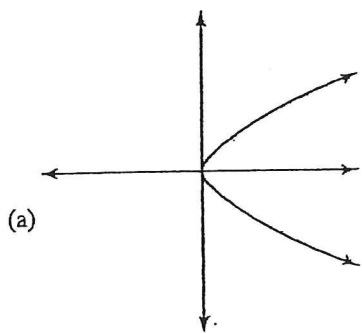
(d) $y = \pm(2x) + 3$

(e) $y = \begin{cases} \frac{1}{x}, & x < 0 \\ \sqrt{x}, & x \geq 0 \end{cases}$

(f) $y = \begin{cases} x^2, & x \leq 1 \\ \ln x, & x \geq 1 \end{cases}$

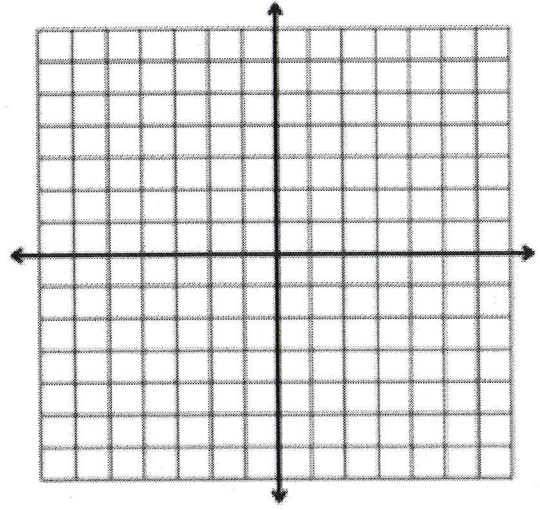2. If $f(x) = x^2 - 25$, $g(x) = x^2 + 9x + 20$, and $h(x) = \dfrac{f(x)}{g(x)}$, what is the domain of h?

3. If $f(x) = |x| + 1$ and $g(x) = \dfrac{1}{3x^2 + 4}$, find $f(4) - g(3) + (fg)(0)$.

4. Write the function, m, whose graph is given below. Also, find the domain and range of m.

$m(x)$
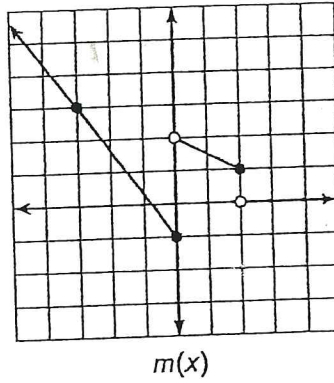
5. If $p(x)$ is defined by the graph below, evaluate $[\![m(-3)]\!]$, $[\![m(0)]\!]$, and $[\![m(4)]\!]$.

$p(x)$
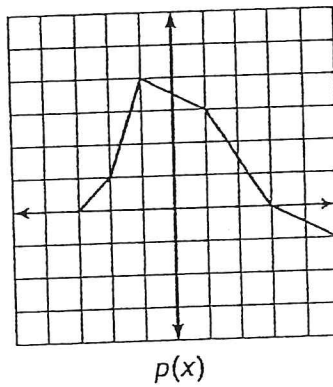
6. Graph some function $s(x)$ such that

- $s(1) = 4$
- $s(-2) = s(2) = s(5) = 0$
- s is increasing on $(-6,1) \cup (4,6)$
- s has domain $[-6,6]$ and range $(-2,4]$

PROBLEM SET 2

You may use a graphing calculator on problems 7 through 9.

In problems 1 through 6, determine if the given function is even, odd, or neither.

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

2. $p(x) = 2x^3 + \sqrt[3]{x}$

3. $m(x) = \dfrac{-3x^3\left(1 + 4x^2\right)}{2x^4 - 5x^2}$

4. $b(x) = x^7 + 5x^3 - 17$

5. $v: \{(-1,4),(2,6),(1,4)\}$

$r(x)$
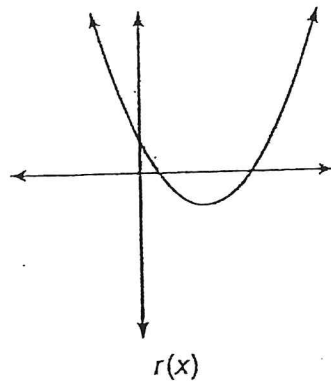
7. The equation $x = y^2$ has an x-symmetric graph. In x-symmetric graphs, if the point (x,y) is contained, then so is $(x,-y)$. Why aren't x-symmetric functions used as often as y- and origin-symmetric functions in calculus?

8. Complete the below graph of f if ...

    (a) f is odd

    (b) f is even
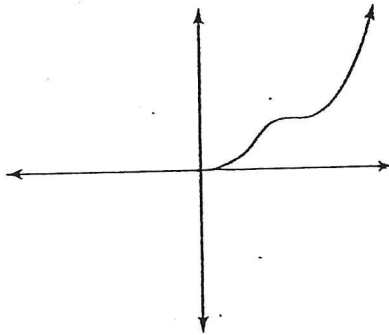
9. If $j(x)$ and $k(x)$ are odd functions and $h(x) = \frac{j(x)}{k(x)}$, what kind of symmetry characterizes h?

PROBLEM SET 3

You may use a graphing calculator on all of these problems.

1. If $f(x) = x^2 + 3x + 1$ and $g(x) = \sqrt{x-2}$, find

   (a) $(f \circ g)(x)$

   (b) $g(g(x))$

   (c) $g^{-1}(f(x))$

   (d) $g(f(4))$

Use the chart below for problems 2 and 3.

x	r(x)	s(x)
-3	1	2
-2	0	4
-1	2	6
0	5	-1
1	3	1
2	-1	-3
3	-3	4

2. If $r(x)$ and $s(x)$ are functions, as defined above, evaluate

   (a) $r(s(2))$

   (b) $s(r^{-1}(0))$

   (c) $r^{-1}(r^{-1}(s(1)))$

3. Why does $s^{-1}(x)$ not exist?

4. Find the inverse functions of each (if possible):

   (a) $p(x) = 2x^3 - 1$

   (b) $y = [\![x]\!]$

5. If $h(x) = x^5 + 3x - 2$, find $h^{-1}(4)$.

6. Using the definition of one-to-one functions, explain why function m, as defined in the function map below, has no inverse.

PROBLEM SET 4

Do not use a graphing calculator on these problems.
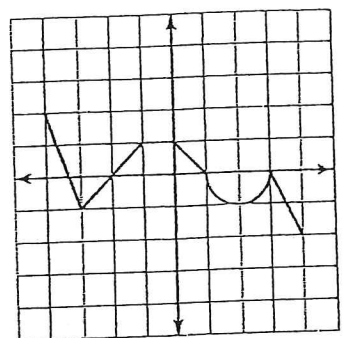
1. Graph the following:

   (a) $y = (x - \pi)^2 + 2$

   (b) $y = \dfrac{1}{x+1} - 1$
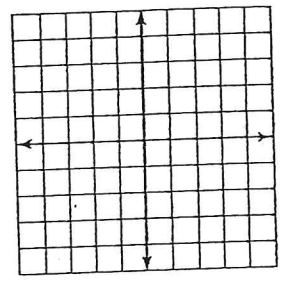
   (c) $y = |x-1| + 3$

   (d) $y = -(|x|)^3$

   (e) $y = \left| \sqrt{-(x-3)} - 2 \right|$

2. Explain mathematically why the graphs of $y = (-x)^3$ and $y = -(x^3)$ are identical.

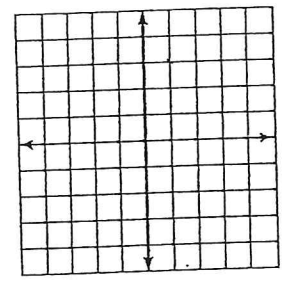3. Given $f(x)$ as defined in the below graph, graph the indicated translations:

Graph of $f(x)$
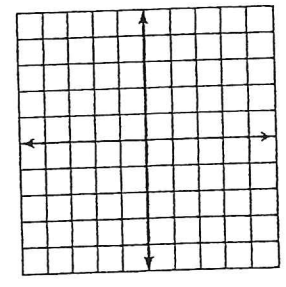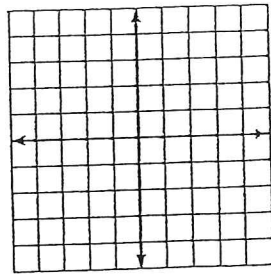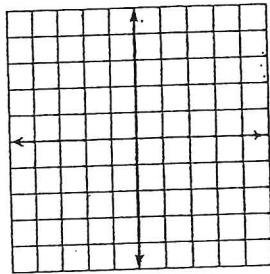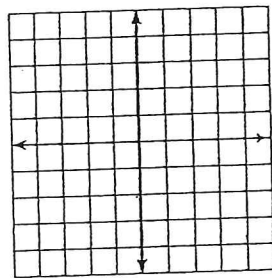
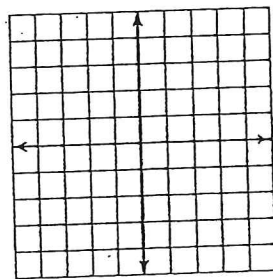(a) $f(x) - 2$

(b) $f(x + 1)$

(c) $-f(x)$

(d) $f(-x)$

(e) $|f(x)|$

(f) $f(|x|)$

(g) $g^{-1}(x)$, if $g(x) = f(x)$ when $-3 \le x \le -1$

4. Why does $y = \sqrt{-x}$ have a graph if you cannot find a real square root of a negative number? (answer based on the graph)

Challenge Exam for the Precalculus

1. Find the radian measure of an angle whose degree measurement is $330°$.

2. Which of the following numbers is the smallest?

   a) $\sin\dfrac{\pi}{3}$ b) $\sin\dfrac{\pi}{4}$ c) $\sin\dfrac{\pi}{6}$ d) $\sin\pi$

3. In a right triangle ABC, angle C is the right angle, side $AC = 5$ and $\sin B = 0.64$. Find the length of side AB to the nearest tenth.

   A
   |\
   5| \
   | \
   C —— B
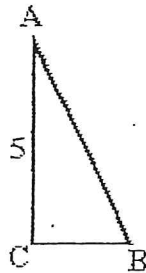
4. Evaluate: $\csc\left(\dfrac{4\pi}{3}\right)$

5. Simplify $\sin(180° - q)$ in terms of $\sin q$ or $\cos q$.

6. Evaluate $\sin^2(4q) + \cos^2(4q)$ for all q.

7. In a right triangle ABC, angle C is the right angle.

   If side $AB = 2$ and $AC = x$, . find an expression for $\tan B$.

   A
   |\
   x| \2
   | \
   C —— B
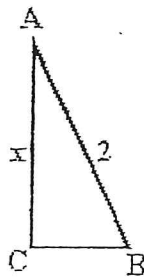
8. Rewrite the trigonometric identity for $\sin 2q$ and $\cos 2q$ in terms of the angle q

9. Final all solutions of x in the interval $0° £ q < 360°$ satisfying the equation

   $2\sin^2 q + \sin^2 q - 1 = 0$.

10. For what values of q in the interval $0 £ q < 2p$ is $\cos 4q = 1$.

11. What is the period of $y = 4 \sin 3\theta$

12. Use the law of cosines given below to find an expression for angle A in triangle ABC if $AB = 8$, $AC = 4$, and $BC = 6$:
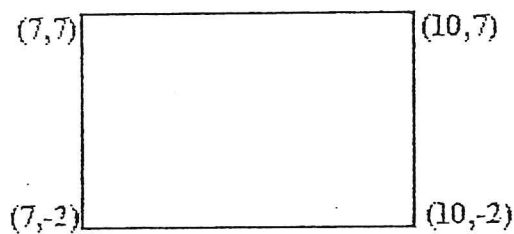
Law of cosines: $a^2 = b^2 + c^2 - 2bc \cos A$.
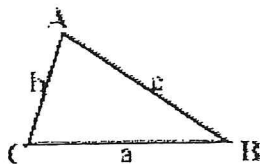
13. Evaluate: $4 \, Arc \sin \left(\dfrac{1}{\sqrt{2}} \right)$.

14. Simplify: $(\cos^2 q)(\tan q)(\csc^2 q)$

15. Let $f(x) = -x^2 + 5$. Evaluate $f(1)$.

16. Find the slope of the line $3x - 5y = 1$.

17. Write the equation of the line passing through the point $(3, -4)$ having slope $-\dfrac{3}{4}$

18. A rectangle has vertices $(7, 7)$, $(10,7)$, $(7,-2)$ and $(10,-2)$. Find the length of the diagonal.

19. If $f(x) = x^2$, simplify $\dfrac{f(x+a) - f(x)}{a}$

20. Graph $|x|$ and $|x+1|$ and $|x-1|$

21. If $x = e^{y-2}$. Solve for y in terms of x

22. The graph of the parabola $y = -x^2 + 16x + 1$ is symmetric with respect to what line?

23. If $f(x) = 9x^2 + 1$ and $g(x)) = \sqrt{x}$ · Find $f(g(x))$ and $g(f(x))$. Simplify if possible.

24. If $f(x) = \dfrac{2x-1}{x^2}$ For which value(s) of x is $f(x) = $ undefined. 1?

25. Find the domain and range of $y = \sqrt{x^2 - 16}$

26. Find the points of intersection of the graphs $y = 2x^2$ and $y = 3-5x$.

27. Simplify: $\log_2\left(\dfrac{1}{16}\right)$

28. Use log rules to simplify $\ln\left(\dfrac{\sqrt{x^2+1}}{x}\right)$

29. The polynomial $x(x^2 - 16)(x^2 + 16)$ has how many real roots?

30. Consider $y = \ln x$. What is the range and domain? What is the x intercept?