Precalculus Exam 1, Spring 2013. 1.1-2.3. Name_____

class hour or section number or instructor _____

**Show clear supporting work** on problems with several steps. Algebraic problems that display little or no supporting work will get **little or no credit**. You do not need to show work on one-step calculator problems. To solve numerical problems guess-and-check is legal unless you are requested to solve them "algebraically." Find numerical answers with at least three correct significant digits:

1. Evaluate, with at least three correct significant digits

a) $\dfrac{3+2\pi^2}{\pi+6}$ 2.49

b) Let $k = 12.2$, $d = -3.4$, and $c = 4.39$. Evaluate

$$\frac{k+cd}{2+\sqrt{d^2+ck}} \quad -.271$$

2. State the Zero Product Rule (symbolically).

$ab=0$ if $a=0$ or $b=0$

3. Let $f(x) = 5x + 7$.

a) Find simpler $g$ and $h$ so that $f(x) = g(h(x))$.

$g(x) =$ $x+7$ $h(x) =$ $5x$

b) Solve for $x$: $f(f(x)) = 50$.

$5(5x+7)+7=50$

... $x = .32$

4. Suppose you graph $f(x)$ in the standard window ([-10, 10] by [-10, 10]) and the graph appears narrower than you would like. You want it to appear wider in the window. You have the best chance of getting what you want if you (pick one)

a) Change the $y$-interval to [-20, 20]
b) Change the $y$-interval to [-5, 5]
c) Change the $x$-interval to [-20, 20]
(d) Change the $x$-interval to [-5, 5].

| Problem | points | score |
|---|---|---|
| 1 | 8 | |
| 2 | 4 | |
| 3 | 8 | |
| 4 | 4 | |
| 5 | 5 | |
| 6 | 10 | |
| 7 | 6 | |
| 8 | 12 | |
| 9 | 6 | |
| 10 | 6 | |
| 11 | 4 | |
| 12 | 9 | |
| 13 | 6 | |
| 14 | 6 | |
| 15 | 6 | |
| total | 100 | |

5. Facts can express methods. State, symbolically (as we did in Section 1.4) the *algebraic formulation* of the *method* used to evaluate expressions like "20 - 42" and "3 - 19" and "42 - 67," given we know how to subtract smaller positive integers from larger positive integers. (The question does not ask for numerical values.)

$a-b=-(b-a)$

6. There are four ways to solve equations. Inverse-Reverse (IR), Zero Product Rule (ZPR), Quadratic Formula (QF), and Guess and Check (GC). For each of the following name the **algebraic method best suited** to solving the equation. If and only if none of the three algebraic methods work, pick GC. Do NOT solve these! Name the method (abbreviations are ok)!

a) $\ln(2x - 7) = 3.7$ IR

b) $(x + 2)(x - 1) - 5.9 = 0$. QF

c) $(x + 2)(x^2 + 2x - 6.2) = 5.7$. G&C

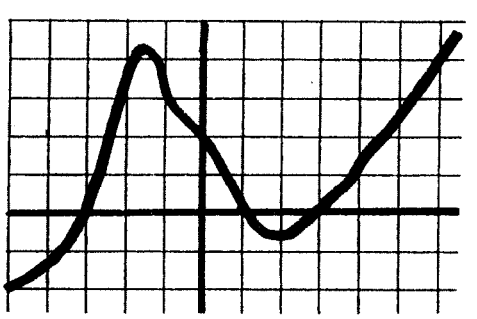
d) $(x - 4)(x + 2)^2 + 4(x - 4)^2(x + 2) = 0$. ZPR

e) $(x - 4)(x + 2)^2 + 4(x - 4)(x + 3) = 1$. G&C

7. a) Solve for $x$: $(x + 3)^2 = 50/x$. b) Explain, very briefly, how you did it.

$x=2$ graph it, use G&C

8. Here is a representative graph of $f$.
The grid lines are one unit apart.
[Approximate answers are good enough.]



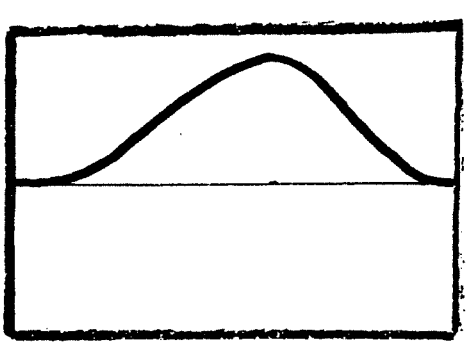
a) Find $f(1)$. 0

b) Solve $f(x) = 3$. $x = -2$ or $-1$ or $5.3$

c) Solve $f(x) < 0$. $x < -3$ or $1 < x < 3$

d) Solve $f(x) = -x$ $x = -2.3$

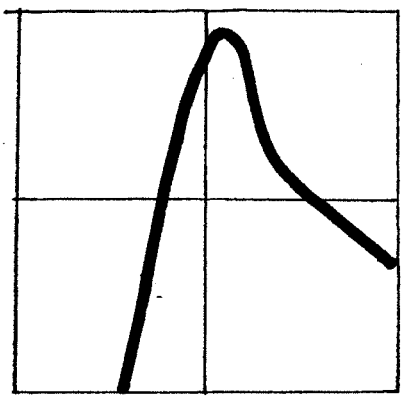
9. Here is the graph of $y = x^4(1 - x)^3$ in a certain window. Find the window.
[Approximate answers are good enough.]

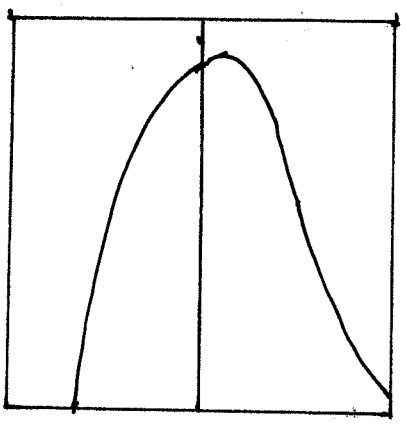


The $x$-interval is $[0, 1]$.

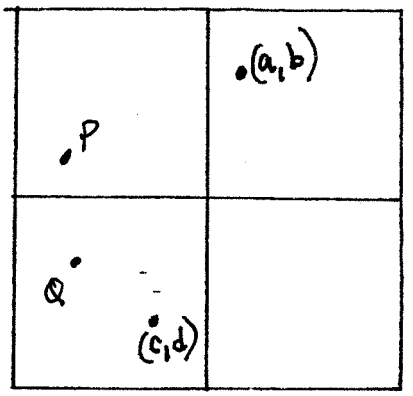
The $y$-interval is $[-.01, .01]$.

10. The figure on the left graphs $f(x)$ in the standard window [-10, 10] by [-10, 10]. Show what it would look like in the other window, [-5, 5] by [0, 10]. Mark three points (your choice) on the graph in the left window and mark the corresponding points on the graph you create in the right window. [Three bold dots on the left graph and three bold dots on the right graph you create.]





11. The figure to the right gives the locations of $(a, b)$ and $(c, d)$ on a square scale. In the same window, sketch the locations of $P = (-b, a)$ and $Q = (d, c)$.

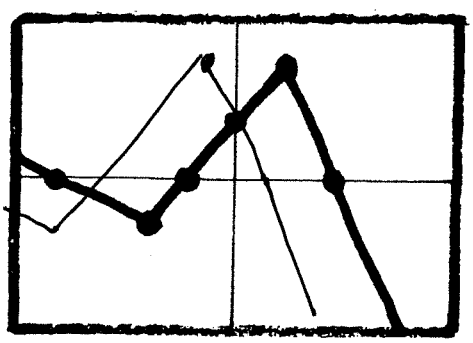


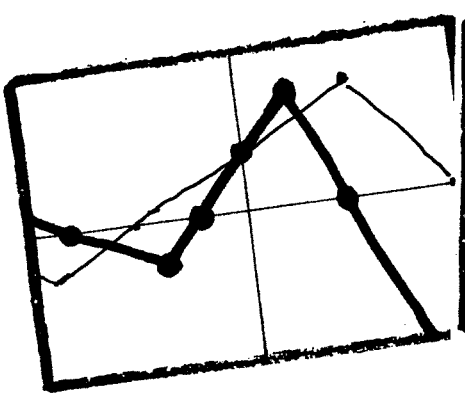

12. Here is a representative graph of $f(x)$ in the standard window [-10, 10] by [-10, 10] (three times, once in each window below.) Get the three emphasized points right and sketch in the rest.

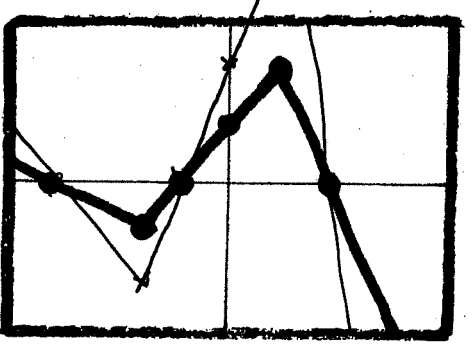
On the axis-system below, sketch the graph of $f(x+3)$.

On the axis-system below, sketch the graph of $f(x/2)$.

On the axis-system below, sketch the graph of $2f(x)$







13. Find $f^{-1}$ if $f(x) = 1/(x - 3)$.
Show your work (as always) and then fill in the blank: $f^{-1}(x) =$ _____.

NOT on Exam 1, Fall 2013

14. Here is a theorem from calculus: $\int_a^b (x + c)^2 dx = \frac{(b + c)^3}{3} - \frac{(a + c)^3}{3}$

Read it and use it to find:

$\int_0^4 (x + 3)^2 dx$.

$\frac{(4+3)^3}{3} - \frac{(0+3)^3}{3} = 105.3$

15. This problem asks you to read and use a definition:
Let $a \boxtimes b = 5a - 2b$.
a) Find $5 \boxtimes k$

$5(5) - 2k = 25 - 2k$

b) Solve for $x$: $3 \boxtimes x = x \boxtimes 2$

$15 - 2x = 5x - 4$

$19 = 7x$

$x = \frac{19}{7} = 2.714$