

October 18, 2001

Your name _____

The first 10 problems count 6 points each and the final ones counts as marked. Problems 1 through 10 are multiple choice. In the multiple choice section, circle the correct choice (or choices). You do not need to show your work on multiple choice items. You must show your work on the other problems. The total number of points available is 117.

1. Which of the following is the exact value of $|6 - 2\pi| + |8\pi - 25|$?
(A) $10\pi - 19$ (B) $10\pi - 31$ (C) $10\pi + 31$ (D) $6\pi - 19$ (E) $6\pi + 19$
2. The points $(-1, 3)$, $(2, 4)$, and $(x, 10)$ belong to the line L for which of the following values of x ?
(A) 18 (B) 19 (C) 20 (D) 21 (E) 22
3. What is the length of the hypotenuse of the right triangle whose vertices are at the points $(0, 1)$, $(3, 1)$, and $(3, -3)$?
(A) $2\sqrt{2}$ (B) $3\sqrt{2}$ (C) 5 (D) $4\sqrt{2}$ (E) 6
4. The equation $x^2 - 8x + y^2 + 10y = 8$ describes a circle with center at (h, k) and radius r . Find $h + k + r$.
(A) 4 (B) 6 (C) 10 (D) 14 (E) 20
5. Suppose the value of a new car declines linearly over a ten year period from the original value of \$20,000 to the value \$2,000. What is the value of the car after six years?
(A) \$8,800 (B) \$9,200 (C) \$11,000 (D) \$12,800 (E) \$14,600

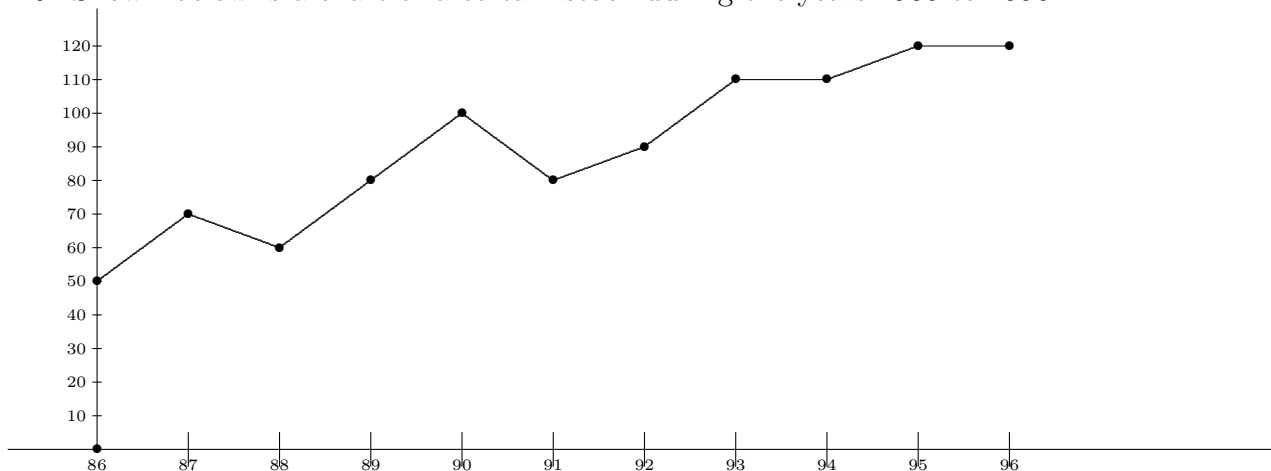
6. Yasmin starts at a point A and walks north 2 miles, then walks east 3 miles, then south 1 mile, then east 1 mile, and finally she walks north again 2 miles, arriving at point B . Which of the following is closest to the distance between point A and point B ?
- (A) 3 (B) 4 (C) 5 (D) 5.8 (E) 6.3

Suppose the functions f and g are given completely by the table of values shown. The next three problems require the use of the table.

x	$f(x)$	$g(x)$
0	2	5
1	7	7
2	6	4
3	1	2
4	3	6
5	6	3
6	0	1
7	4	3

7. What is $g(g(2) + f(0) - g(3))$?
- (A) 1 (B) 3 (C) 4 (D) 5 (E) 6
8. Which of the follow values of x satisfies $f(g(f(x))) = 0$?
- (A) 0 (B) 1 (C) 4 (D) 6 (E) 7
9. What is $g(g(3) \cdot g(5) - f(7))$?
- (A) 1 (B) 3 (C) 4 (D) 5 (E) 6

10. Shown below is a chart of a certain stock during the years 1986 to 1996.



By what percentage increase did the stock grow during the two years between 1988 and 1990?

- (A) 40% (B) 50% (C) 60% (D) 66% (E) 100%

On all the following questions, **show your work**.

11. (10 points) Let $h(x) = \sqrt{5 - x^2}$. Find two functions f and g , both simpler than h such that $f \circ g(x) = h(x)$.

12. (10 points) Let $g(x) = 2x - 3$ and

$$f(x) = \begin{cases} |2x| - x^2 & \text{if } x \leq 2 \\ 3x - 5 & \text{if } x > 2 \end{cases}$$

(a) Compute the values $g \circ f(0)$, $g \circ f(1)$, $g \circ f(2)$, $g \circ f(3)$, and $g \circ f(\pi)$.

(b) Find a (symbolic) representation of $g \circ f$.

13. (12 points) Suppose $g(x) = x^2$ on the domain $[-2, 1]$. Sketch the graph of each of the following functions and state the domain of each.

(a) $f(x) = g(2x)$

(b) $h(x) = 3 - g(x - 1)$

(c) $k(x) = 4g(x + 1)$

14. (10 points) Find an equation for the line L satisfying
- (a) L is parallel to the line defined by $4x - 2y = 3$, and
 - (b) L contains the point $(3, 1)$.

15. (15 points) Explain how you can describe the graph of the quadratic equation

$$y = ax^2 + bx + c$$

based on the coefficients a, b , and c . Hint: it may be useful to define the discriminant D to be $b^2 - 4ac$. In particular, address the questions (a) does the curve open upwards or downwards, and (b) does it have x -intercepts? Your job on this problem is to tell someone how they can easily find out about the nature of the parabola.