February 6, 2002   Your name   _____

The first 11 problems count 5 points each and the final ones counts as marked. Problems 1 through 11 are multiple choice. In the multiple choice section, circle the correct choice (or choices). You do not need to show your work on problems 1 through 11, but you must show your work on the other problems. The total number of points available is 127.

1. What is the coefficient of the x^2 term in the product $(x^2 - 3x + 7)(x + 5)$?

   (A) -3 **(B)** 2 **(C)** 3 **(D)** 5 **(E)** 7

2. Which of the following is a factor of $8x^3 - y^3$? Circle all those that apply.

   (A) $x - y$ **(B)** $x + y$ **(C)** $2x - y$ **(D)** $2x + y$ **(E)** $4x - y$

3. Which of the following is a root of $x^2 - 2x = 15$?

   (A) 2 **(B)** 3 **(C)** 5 **(D)** 15 **(E)** 17

4. How many roots does the equation below have?

$$x^2(x^2 - 3) - 4(x^2 - 3) = 0$$

   (A) 0 **(B)** 1 **(C)** 2 **(D)** 3 **(E)** 4

5. What is the distance between the point $(-2, 3)$ and the midpoint of the line segment joining $(3, 9)$ and $(5, 13)$?

   (A) $\sqrt{14}$ **(B)** 9 **(C)** $\sqrt{90}$ **(D)** 10 **(E)** $\sqrt{149}$

6. What is the value of $|6\pi - 19| - |16 - 5\pi|$?

   (A) $3 + \pi$ **(B)** $\pi - 3$ **(C)** $3 - \pi$ **(D)** $35 + 11\pi$ **(E)** $11\pi - 35$

7. If $b^2 - 4ac = 0$, then the number of roots of $ax^2 + bx + c = 0$ is

    (A) 0   **(B)** 1   **(C)** 2

    (D) 3   **(E)** cannot be determined from this information

8. Which of the following points belongs to the circle of radius 5 and center at $(4, 7)$?

    (A) $(7, 8)$ **(B)** $(7, 9)$ **(C)** $(7, 10)$ **(D)** $(7, 11)$ **(E)** $(7, 12)$

9. What is the slope of the line passing through $(7, 8)$ that is perpendicular to the line $3x - 4y = 7$?

    (A) $3/4$ **(B)** $-3/4$ **(C)** $4/3$ **(D)** $-4/3$ **(E)** $3/7$

10. What is the slope of the line that includes the points $(-2, 3)$ and $(3, -4)$?

    (A) $-7/5$ **(B)** $-1/5$ **(C)** $1/5$ **(D)** $7/5$ **(E)** 7

11. Which of the following points is not in the domain of the function f defined by $f(x) = \sqrt{(x-1)(x+1)}$?

    (A) -3 **(B)** -1 **(C)** 0 **(D)** 1 **(E)** 4

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

12. (12 points) The relationship between the Celsius (C) and the Fahrenheit (F) temperature scales is linear. Water boils at $212°F$ which is equivalent to $100°C$. Also, water freezes at $32°F$ and at $0°C$. Find F as a function of C and use this equation to find the Fahrenheit temperature in the central square in Seville, Spain, in August, 1997 when the Celsius temperature was $53°$.

13. (20 points) Let $f(x) = \sqrt{2x}$. Use the definition of derivative (ie, the difference quotient) to compute $f'(x)$.

14. (20 points) Use the definition of derivative (ie, the difference quotient) to compute the derivative of the following function: $f(x) = 1/x$.

This part of the test is for you to take home. Its due next class meeting. You're on your honor not to discuss it with anyone. You must sigh a pledge that you have not done so. Sign below: I have not discussed this problem with anyone.

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15. (20 points) Let

$$f(x) = \begin{cases} x - 1 & \text{if } x \leq 2 \\ 3x - 10 & \text{if } x > 2 \end{cases}$$

and let

$$g(x) = \begin{cases} x^2 - 3 & \text{if } x \leq 0 \\ x + 2 & \text{if } x > 0 \end{cases}$$

(a) (4 points) Compute $g \circ f(-1), g \circ f(0), g \circ f(1), g \circ f(1.5), g \circ f(2), g \circ f(3), g \circ f(\pi)$, and $g \circ f(4)$.

(b) (16 points) Find a symbolic representation of $g \circ f(x)$. Simplify your answer.