### WORCESTER POLYTECHNIC INSTITUTE

## SIXTEENTH ANNUAL INVITATIONAL MATH MEET OCTOBER 23, 2003

#### INDIVIDUAL EXAM QUESTION SHEET

DIRECTIONS: Please write your answers on the Individual Answer Sheet provided. This part of the contest is 45 minutes. Each correct answer to questions 1-4 is worth 1 point, to questions 5-8 is worth 2 points and to questions 9-11 is worth 3 points. Calculators MAY NOT be used.

- 1 Where does the parabola  $y = 6x^2 + 13x 63$  cross the x-axis?
- 2 Find an expression for the angle made by the line  $y = \frac{1}{9}x 22$  and the x-axis.
- 3 Factor  $x^{16} 1$
- 4 For the function

$$f(x) = 8x^7 + 6x^5 + x^4 + 9x^3 + 6x^2 + 5x + 1$$

how many positive roots does it have?

- 5 If  $f(x) = \frac{2x-1}{3x-5}$  find a formula for  $f^{-1}$ .
- [6] Simplify  $10^{-3\log_{10}(5)}$ .
- 7 Find the coordinates of the center of the conic section

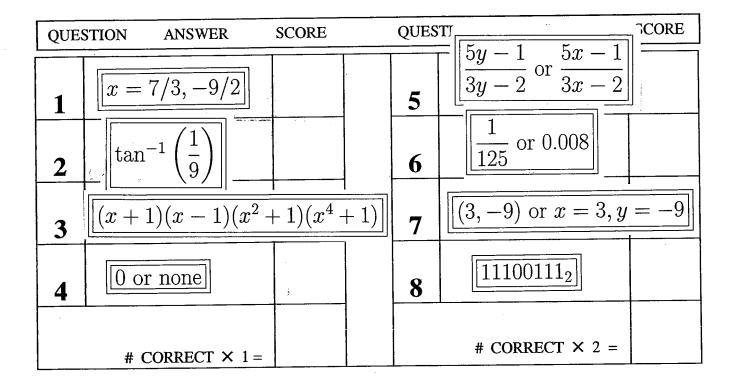
$$2x^2 - 12x + 72y + 4y^2 = 329$$

- 8 If x = 231 in base 10, what is it in binary?
- 9 If one selects a random point from a 2' x 2' square, what is the probability that such a point is within one foot of the center of the square?
- 10 Find all roots of  $x^3 + 4x^2 + x 6 = 0$
- 11 If x = .783478347834... is a repeating decimal, express it as a rational number.

NAME\_Answer Key

## WORCESTER POLYTECHNIC INSTITUTE

# SIXTEENTH ANNUAL INVITATIONAL MATH MEET OCTOBER 23, 2003 INDIVIDUAL EXAM **ANSWER** SHEET



QUESTION		ANSWER	SCORE
9		$\boxed{\pi/4}$	
10	[1,	-3, -2	
11		7834 9999	
# CORRECT × 3 =			

## **Individual Total**