The College of Staten Island
Department of Mathematics
Math 130 Final Exam
Fall 2009

Name _____

Part I : Answer all questions in this part in the space provided. No credit will be allowed if work is not shown. Each question is worth 6 points.

1. $f(x) = x^3 - 5x^2 + 11x - 15$

   a) Give a complete list of all possible rational zeros

   b) Find all the zeros

   c) Express f(x) as a product of linear factors

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2. Use a graphing calculator to determine any relative maxima or minima of the function $f(x) = 0.1x^3 - 0.6x^2 - 0.1x + 2$ and to determine intervals on which function is increasing or decreasing.

   rel maxima _____

   rel minima _____

   interval(s) function is increasing _____

   interval(s) function is decreasing _____

3. Simplify $\sin(\cos^{-1}(\frac{2}{3}))$. No credit will be allowed unless answer is written as a fraction.

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4. Given complex number $z = 2(\cos 60^0 + I \sin 60^0)$, compute z^4, first in trigonometric form, then convert your answer to standard form.

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5. Determine whether the function :

   $h(x) = 2x^3 - 3x^2 + 1$ is even, odd or neither. Explain your answer.

6. Given: $\sin x = \frac{3}{5}$, x is in quadrant I, and $\cos y = \frac{2}{3}$, y is in quadrant IV, $\tan u = \frac{4}{1}$, u is in quadrant III

Find :

a) sin 2x

b) cos(x+y)

c) $\tan(\frac{u}{2})$

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7. Prove the identity: $\frac{1+\cos^2 x}{\sin^2 x} = 2\csc^2 x - 1$

8. Solve : $2 \cos x \sin x + \sin x = 0$ for all solutions in $[0, 2\pi)$

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9. Write an equation of a function that has the shape of $y = \sqrt{x}$, but is reflected across the y – axis and shifted down 2 units.

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10. Find the center and radius of the circle with the given equation. Then sketch the circle: $x^2 + y^2 - 6x + 2y = 6$

Part II: Answer only five questions in this part (8 points each) . Write the word omit or cross out those questions that you do not wish to answer. If you answer more than five questions, only the first five will be graded.

11. Solve triangle ABC. $A = 126.5^0$, $a = 17.2$, $c = 13.5$

Find: B (nearest tenth)

C (nearest tenth)

b (nearest tenth)

12. Solve the following system of equations for x and y :

$x^2 + y^2 = 25$

$3x - 4y = 0$

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13. Given that $y = 2 \sin (2x + \pi)$, find the following;

a) The Amplitude: _____

b) The Period: _____

c) The Phase Shift: _____

d) Sketch the graph:

14. Consider the following:

$$f(x) = \frac{x + 5}{x^2 + 4x - 32}$$

Find:

a) The coordinates of the x-intercept(s)

b) The coordinates of the y-intercept(s)

c) The equation(s) of the vertical asymptote(s)

d) The equation (s) of the horizontal asymptote(s)

e) Sketch the graph of f(x). Be sure to show and label all intercepts and asymptotes.

15. Solve the inequality. Write your answer in interval notation. Show all work.

$$\frac{x-5}{x-1} + 3 < 0$$

Intervals Test Value Sign of f(x)

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16. For the ellipse $9x^2 + 4y^2 + 18x - 16y = 11$, find the center, vertices, foci, and guide points. Sketch the graph showing all of the above. What is the eccentricity for this ellipse?

17. Let $z1 = 1 - i$ and $z2 = 2 + 2i$

Convert to trigonometric notation and then multiply or divide.
[Final answers should be in standard notation]

a) $z1 * z2$

b) $\frac{z1}{z2}$

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18. Prove the following identity by Mathematical Induction.

$$5 + 10 + 15 + \ldots\ldots + 5n = \frac{5n(n+1)}{2}$$