

Anna Carter

THE COLLEGE OF STATEN ISLAND
Department of Mathematics
Math 130 Final Exam
Spring 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. $f(x) = x^3 + 3x^2 - 2x - 6$

Find the rational zeros and then the other zeros: that is, solve $f(x) = 0$

1. rational zero(s) _____

Other zero(s) _____

2. Graph the function on your graphing calculator. Find the interval(s) on which the function is increasing or decreasing and find any relative maxima or relative minima

$g(x) = -x^3 + 6x^2 - 9x - 4$

2. rel maxima _____

rel minima _____

interval(s) function is increasing _____

interval(s) function is decreasing _____

3. Evaluate: (in terms of x) $\cos(\arctan \frac{x}{3})$

3 _____

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

4. _____

5. Use Descartes' Rule of Signs to determine the number of positive real zeros, number of negative real zeros and the number of nonreal zeros.

$$h(x) = 6x^7 + 2x^2 + 5x + 4$$

5. Positive Negative Nonreal

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

Find:

a) $\sin 2x$

b) $\cos (x + y)$

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

7. Prove the identity:

$$\frac{2 \tan \Theta}{1 + \tan^2 \Theta} = \sin 2\Theta$$

8. Solve: $\tan^2 x + \sec x - 1 = 0$ $[0, 2\pi)$

9. Let $f(x) = \sqrt{x}$. What transformations would one apply to the graph of $f(x)$ to obtain the graph of:

$$g(x) = -5\sqrt{x+3} + 7$$

List the transformations (i.e., horizontal / vertical shifts, compressions, expansions, reflections) in the order that they are to be applied.

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 the triangle: $A = 126.5^\circ$, $a = 17.2$, $c = 13.5$

Find : B (nearest tenth)

C (nearest tenth)

b (nearest tenth)

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

$$y = x^2 - 2$$

$$x + 2y = 11$$

13. Sketch a graph of $y = 3 \sin \left(2x + \frac{\pi}{2} \right) + 1$

Find the amplitude, the period , and the phase shift.

14. Consider the function : $f(x) = \frac{x-5}{x-1} + 3$ and find each of the following:

a) the y – intercept

b) the x – intercept (s)

c) the equation(s) for all vertical asymptote(s)

d) the equation(s) for all horizontal asymptote(s)

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

- (f) Find the interval(s) for which $\frac{x-5}{x-1} + 3 < 0$

Write your answers in interval notation. You may use your graphing calculator and the results of earlier parts of this problem to help you find the answer.

15. Find the center, vertices, and foci for the ellipse: $\frac{(x-1)^2}{25} + \frac{y^2}{9} = 1$

Then sketch it. Showing all of the above, what is the eccentricity for this ellipse?

-
16. Let $z_1 = 5i$ and $z_2 = \sqrt{3} + i$. Convert to trigonometric form and find :

$$z_1 \bullet z_2 \quad \text{and} \quad \frac{z_1}{z_2}$$

17. Prove the following identity by Mathematical Induction:

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