M121 Fall 95 Exam I Sept. 15, 1995

Name (Print) _____ SSN: _____

Circle the name of your TA and Discussion Hour:
David Krebes 8 AM 11 AM

Qihui Liu: 8am 9am

Jukun Ying 9am 11 am

Answer all questions and **SHOW ALL WORK**. No credit for answers only.

Part I: Multiple choice. No partial credit but SHOW WORK! Circle the letter corresponding to the correct answer.
The next two questions refer to the polynomial:

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

1. Use the **rational roots theorem** to list all possible candidates for rational zeroes of the polynomial $f(x)$.

(A) $1, 2, \pm 5$

(B) $\pm 1, \pm 2, \pm 1/5, \pm 2/5$

(C) $\pm 1, \pm 1/2, \pm 5, \pm 5/2$

(D) $\pm 1, \pm 1/2, \pm 5, \pm 2/5$

(E) $\pm 1, \pm 2, \pm 5$

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2. (a) Use a graph to eliminate some or all of the candidates from the list in the previous question. Copy a sketch of the graph from your calculator and indicate which roots have been eliminated.
(b) Find all **real** zeros of $f(x)$.

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3. Which of the following is a polynomial with **real** coefficients that has 2 and $2 - i$ as zeros?

(A) $(x + 2)(x - 2 - i)$

(B) $(x - 2)(x + 2 + i)$

(C) $(x - 2)(x^2 - 4x + 5)$

(D) $(x + 2)(x^2 - 4x + 5)$

(E) $(x + 2)(x^2 + 5)$

4. The figure below shows a rectangle with its base on the x-axis and its two upper vertices on the graph of the equation $y = 8 - x^2$. Which of the following represents the **area** of this rectangle as a function of x.

(A) $f(x) = 16x - 2x^3$

(B) $f(x) = 16 - 2x^2$

(C) $f(x) = 8 - x^2$

(D) $f(x) = 8x - x^3$

(E) none of the above

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5. The graph of $f(x) = p(x)/q(x)$ where p and q are polynomials are is sketched below. Which of the following descriptions of p and q may be correct?

(A) The degree of q is greater than the degree of p.

(B) The degree of q is one and the degree of p is three.

(C) q has no real zeros and the degree of p is two greater than the degree of q.

(D) p and q have the same degree.

(E) The degree of q is one and the degree of p is two.

6. The graph of $y = -3 + \frac{4}{x+2}$ can be obtained from the graph of $y = 1/x$ by applying in order the following three transformations.
   1. vertical stretch by a factor of a
   2. horizontal shift of b units left or right
   3. vertical shift of c units up or down

   What are the values of a, b, c and in which directions are the shifts?

(A) a =2, b=3 left, c =4 up

(B) a =2, b=3 right, c =4 up

(C) a =2, b= 2 right, c =3 down

(D) a =2, b= 2 right, c =3 up

(E) a =2, b= 2 left, c =3 down

(Partial credit) Write complete solutions and indicate your answers clearly.

7. Find exactly all real zeros of the polynomial $f(x) = 2x^3 + 14x + 20x$. For which x is $f(x) > 0$?

8. The sketch below is of one of the following five functions, which one?

(A) $(x^2 - 5)/(x + 1)(x^2 + 1)$

(B) $(x^2 + 5)/(x + 1)(x^2 + 1)$

(C) $(x^2 - 5)/(x - 1)(x^2 + 1)$

(D) $(x^2 - 5)/(x + 1)(x^2 + 1)$

(E) $(x^2 + 5)/(x - 1)(x^2 + 1))$

Part II : (Partial credit) Write complete solutions and indicate your answers clearly.

9. Consider the function $f(x) = x^4 - x^2 - 1$.
Sketch the complete graph of $f(x)$. Half the credit on this problem will be awarded for your argument that this graph is complete. Explain why your sketch identifies all the zero's of f.