

MAC 1147 TEST IIA
SPRING 2009

- A. Sign your scantron sheet in the white area on the back in ink.
- B. Write and code in the spaces indicated:
- 1) Name (last name, first initial, middle initial)
 - 2) UF ID number
 - 3) Discussion section number
- C. Under "special codes" code in the test ID numbers 2, 1.
- | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | • | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
| • | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
- D. At the top right of your answer sheet, for "Test Form Code" encode A.
- B C D E
- E. While taking the test, please keep your answer sheet covered or turned over at all times.
- F. This test consists of 6 three-point multiple choice questions, 8 five-point multiple choice questions and four pages of partial credit questions worth 25 points. The time allowed is 90 minutes.
- G. WHEN YOU ARE FINISHED:
- 1) Before turning in your test check for transcribing errors. Any mistakes you leave in are there to stay.
 - 2) You must turn in your scantron and tear off sheets to your discussion leader. Be prepared to show your picture I.D. with a legible signature.
 - 3) The answers will be posted after the exam on the web www.math.ufl.edu/~huang/MAC1147.html.

NOTE: Be sure to bubble the answers to questions 1-14 on your scantron.

Part I: 3 points each

1. Which of the following does not have an inverse function?

a. $y = \sqrt{x-1}$

b. $y = (x-1)^3$

c. $y = x^2 + 2$

d. $y = 2x + 1$

2. Write $\frac{1}{i}$ in standard form.

a. i

b. $-i$

c. 1

d. -1

3. Find all the zeros of the rational function $f(x) = \frac{x^3 - x}{x^2 - x - 2}$.

a. $x = 0$ only

b. $x = -1$ only

c. $x = 0, 1$ only

d. $x = -1, 0, 1$ only

4. Given a quadratic function $y = -2(x+1)^2 - 5$, which of the following is not correct?

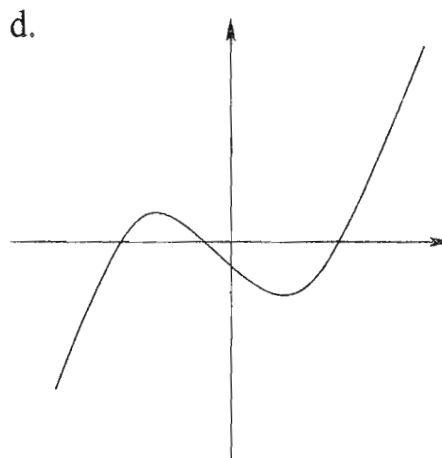
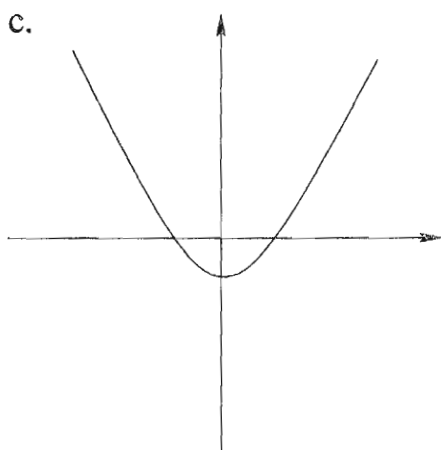
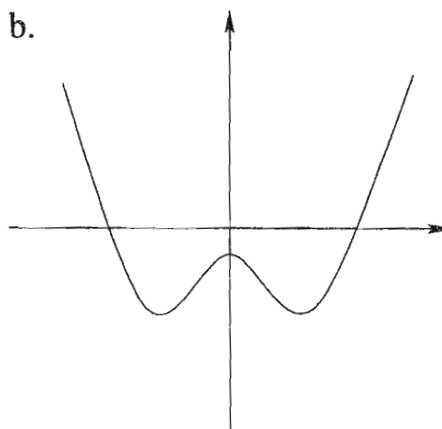
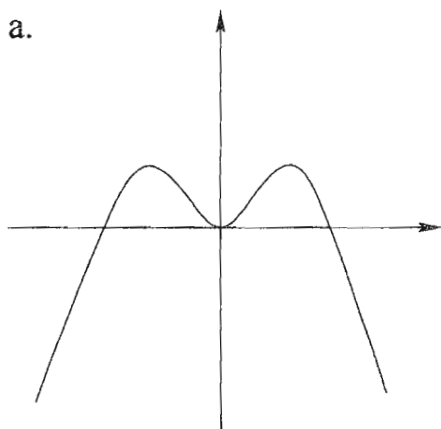
a. The vertex of the parabola is $(1, -5)$.

b. $x = -1$ is the axis of symmetry.

c. The function has a maximum value -5 .

d. The y -intercept is $(0, -7)$.

5. Which of the following represents a polynomial of odd degree?



6. (Bonus!) $\sqrt{-27} \cdot \sqrt{-3} =$

a. $9i$

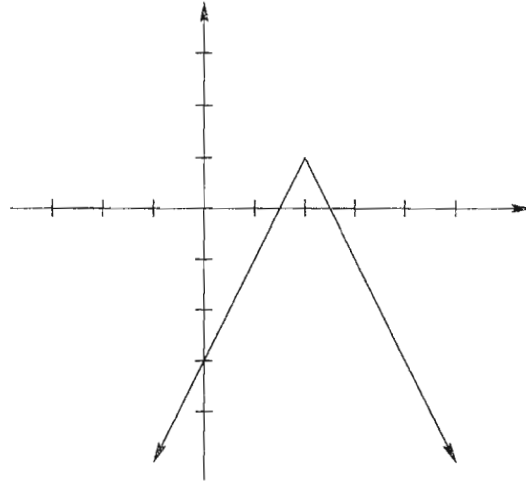
b. $-9i$

c. 9

d. -9

Part II: 5 points each

7. Find the function shown in the graph below.



a. $y = \frac{1}{2}|x + 2| + 1$

b. $y = -\frac{1}{2}|x - 2| + 1$

c. $y = 2|x - 2| + 1$

d. $y = -2|x + 2| + 1$

e. $y = -2|x - 2| + 1$

8. Find the vertex and range of the quadratic function $y = -2x^2 + 8x - 5$.

a. vertex: $(0, -5)$
range: $(-\infty, 0]$

b. vertex: $(2, 3)$
range: $(-\infty, 3]$

c. vertex: $(2, 3)$
range: $[3, \infty)$

d. vertex: $(-2, -29)$
range: $(-\infty, -29]$

e. vertex: $(-2, -29)$
range: $[-29, \infty)$

9. Solve $x^3 + 2x^2 - x - 2 < 0$ and write your answer in interval notation.

a. $(-\infty, -2) \cup (-1, 1)$

b. $(-\infty, -2) \cup (1, \infty)$

c. $(-2, 1)$

d. $(-2, -1) \cup (1, \infty)$

e. $(-1, 2)$

10. Which of the following is/are true?

P. $i^{39} = -1$

Q. $\frac{2+3i}{3+i} = \frac{9}{10} + \frac{7}{10}i$

R. $(\sqrt{3} + 2i)^2 = -1$

a. P only

b. Q only

c. R only

d. P and R only

e. P and Q only

11. If $f(x) = \sqrt{x^2 - 25}$ and g is an odd function with the point $(-12, 13)$ on the graph of g , find $(f \circ g)(12)$.

a. 5

b. -13

c. 13

d. 12

e. -12

12. Which of the following does not have a vertical asymptote?

$$f(x) = \frac{2x^2}{x^2 + 1}$$

$$g(x) = \frac{2-x}{x}$$

$$h(x) = \frac{x^3 - x}{x - 1}$$

a. f only

b. g only

c. h only

d. f and h only

e. f and g only

13. If $f(x) = 2 + (x - 4)^2$, $x \leq 4$, find $f^{-1}(6)$.

- a. 2 b. 6 c. 0 d. $4 + \sqrt{6}$ e. does not exist
-

14. Which of the following is/are true?

P. If $f(x) = (x - 2)^4(x + 3)^3$, 2 is a zero of multiplicity of 4.

Q. If $-2 + i$ is a zero of $f(x) = x^4 + 4x^3 - 4x^2 - 36x - 45$, then we are assured that $2 - i$ is also a zero of $f(x)$.

R. If $f(2) = 0$ for $f(x) = 2x^3 - 3x^2 - 17x + 30$, we are assured that $x - 2$ is a factor of $f(x)$.

- a. P only b. Q only c. R only
d. P, Q and R e. P and R only

MAC 1147 TEST IIA PART II
SPRING 2009

Sect # _____ Name _____

UF ID _____ Signature _____

SHOW ALL WORK TO RECEIVE FULL CREDIT.

1. Find two positive real numbers whose product is a maximum and where the sum of the first number and two times of the second number is 20, using the following steps:

a) If x is the first number and y is the second number, write an equation describing the sum in this problem.

b) Solve for y in step (a)

$y =$ _____

c) Find the product P of the two numbers as a function of x .

$P(x) =$ _____

d) Find the maximum value of the product.

When $x =$ _____ and $y =$ _____, the maximum value of product is _____.

2. Given the polynomial $f(x) = x^4 - x^3 - x^2 - x - 2$:

a) Show that $(x + 1)$ is a factor of $f(x)$ using the synthetic division.

b) Using (a) to factor $f(x)$ into four linear factors.

$$f(x) = \underline{\hspace{10cm}}$$

c) Find all zeros (including complex zeros) of $f(x)$.

$$x = \underline{\hspace{10cm}}$$

3. Solve $\frac{x+4}{2-x} \leq -3$ and express your answer in interval notation.

4. Let $f(x) = \frac{2x^2 + 2x}{1 - x^2}$.

a) Find the following (if none, write "none")

1) domain of f _____

2) equation of vertical asymptote(s) _____

3) hole(s): $x =$ _____ $y =$ _____

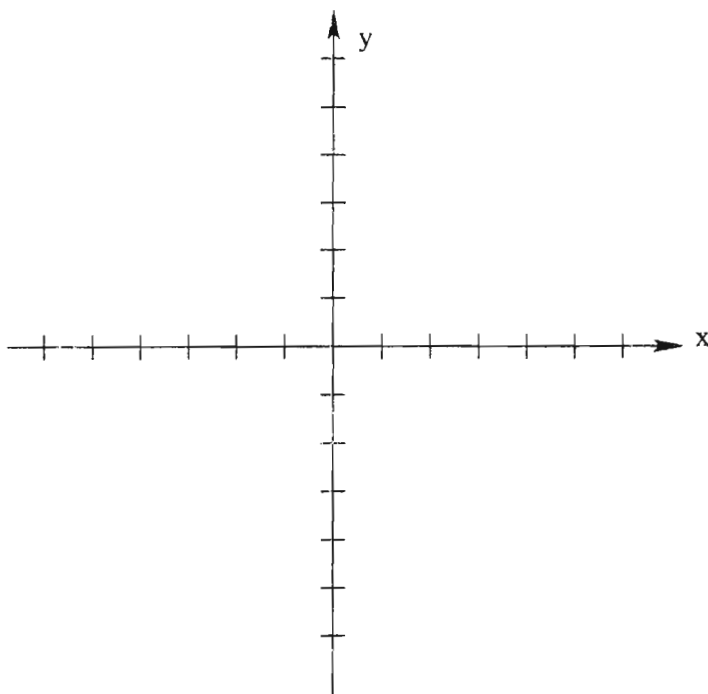
4) equation of the horizontal asymptote _____

5) x -intercept(s): $x =$ _____ y -intercept(s): $y =$ _____

6) Use the zeros of the numerator and denominator to divide the x -axis into intervals. Determine if the graph is above or below the x -axis on each interval.

Interval				
x				
$f(x)$				
above or below				

b) Sketch the graph (indicate any asymptote, hole, x -intercept and y -intercept on your graph).



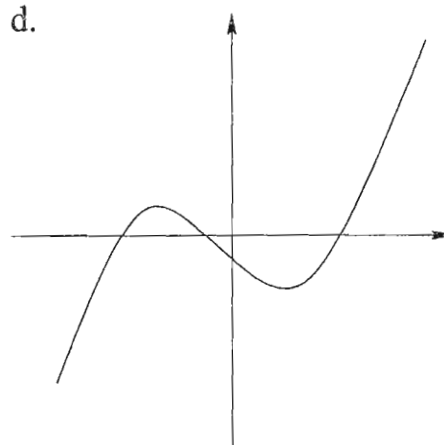
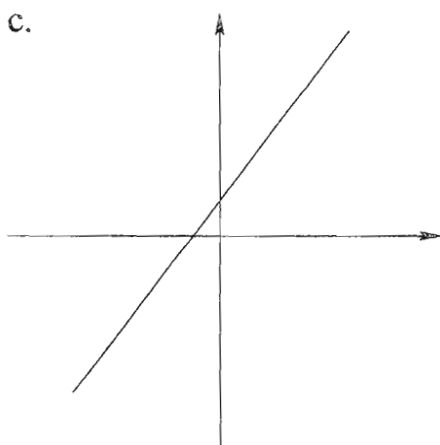
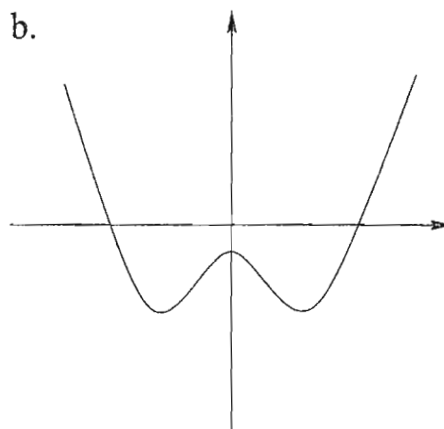
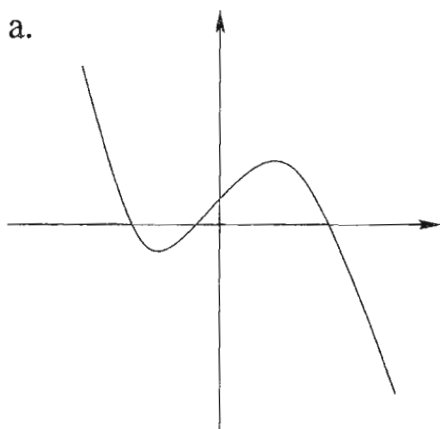
MAC 1147 TEST IIB
SPRING 2009

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- D. At the top right of your answer sheet, for "Test Form Code" encode B.
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|---|---|---|---|---|
| A | • | C | D | E |
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- E. While taking the test, please keep your answer sheet covered or turned over at all times.
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NOTE: Be sure to bubble the answers to questions 1-14 on your scantron.

Part I: 3 points each

1. Which of the following represents a polynomial of even degree?



2. Which of the following does not have an inverse function?

a. $y = |x - 1|$

b. $y = (2 - x)^3$

c. $y = \sqrt{1 - x}$

d. $y = -2x - 1$

3. Given a quadratic function $y = -2(x + 2)^2 - 1$, which of the following is not correct?

- a. The y -intercept is $(0, -9)$.
 - b. $x = -2$ is the axis of symmetry.
 - c. The function has a maximum value -1 .
 - d. The vertex of the parabola is $(2, -1)$.
-

4. Find all the zeros of the rational function $f(x) = \frac{x^3 - x}{x^2 + x - 2}$.

- a. $x = -1, 0, 1$ only
 - b. $x = 0, -1$ only
 - c. $x = 1$ only
 - d. $x = 0$ only
-

5. Write $\frac{1}{i^3}$ in standard form.

- a. 1
 - b. -1
 - c. i
 - d. $-i$
-

6. (Bonus!) $\sqrt{-2} \cdot \sqrt{-8} =$

- a. 4
- b. -4
- c. $4i$
- d. $-4i$

Part II: 5 points each

7. Solve $x^3 + 2x^2 - x - 2 > 0$ and write your answer in interval notation.

- a. $(-\infty, -2) \cup (-1, 1)$ b. $(-\infty, -2) \cup (1, \infty)$ c. $(-2, 1)$
d. $(-2, -1) \cup (1, \infty)$ e. $(-1, 2)$
-

8. Which of the following is/are true?

P. $i^{39} = -i$

Q. $\frac{2 + 3i}{3 + i} = \frac{9}{10} + \frac{7}{10}i$

R. $(\sqrt{3} + 2i)^2 = -1$

- a. P only b. Q only c. R only
d. P and R only e. P and Q only
-

9. Find the vertex and range of the quadratic function $y = 2x^2 - 8x - 5$.

- a. vertex: $(0, -5)$ b. vertex: $(-2, 19)$ c. vertex: $(-2, 19)$
range: $(-\infty, 0]$ range: $[19, \infty)$ range: $(-\infty, 19]$
d. vertex: $(2, -13)$ e. vertex: $(2, -13)$
range: $[-13, \infty)$ range: $(-\infty, -13]$
-

10. If $f(x) = \sqrt{x^2 - 25}$ and g is an odd function with the point $(-12, 13)$ on the graph of g , find $(g \circ f)(13)$.

- a. -13 b. 13 c. 5 d. 12 e. -12

11. Which of the following does not have a vertical asymptote?

$$f(x) = \frac{2x^2}{x^2 + 1}$$

$$g(x) = \frac{x^3 - x}{x - 1}$$

$$h(x) = \frac{2 - x}{x}$$

- a. f only b. g only c. h only
d. f and h only e. f and g only
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12. Which of the following is/are true?

P. If $f(x) = (x + 2)^4(x + 3)^3$, 2 is a zero of multiplicity of 4.

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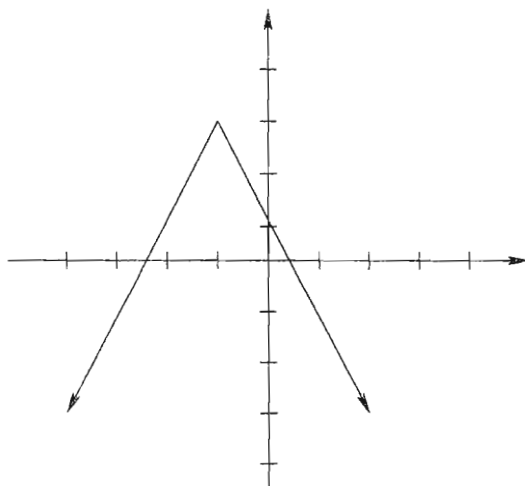
R. If $f(2) = 0$ for $f(x) = 2x^3 - 3x^2 - 17x + 30$, we are assured that $x - 2$ is a factor of $f(x)$.

- a. P only b. Q only c. R only
d. P and R only e. P, Q and R
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13. If $f(x) = 2 + (x + 4)^2$, $x \leq -4$, find $f^{-1}(6)$.

- a. $-4 + \sqrt{6}$ b. 0 c. -2 d. -6 e. does not exist

14. Find the function shown in the graph below.



a. $y = -\frac{1}{2}|x + 1| + 3$

b. $y = \frac{1}{2}|x - 1| + 3$

c. $y = -2|x + 1| + 3$

d. $y = -2|x - 1| + 3$

e. $y = 2|x + 1| + 3$

MAC 1147 TEST IIB PART II
SPRING 2009

Sect # _____ Name _____

UF ID _____ Signature _____

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1. Find two positive real numbers whose product is a maximum and where the sum of the first number and two times of the second number is 40, using the following steps:

a) If x is the first number and y is the second number, write an equation describing the sum in this problem.

b) Solve for y in step (a)

$y =$ _____

c) Find the product P of the two numbers as a function of x .

$P(x) =$ _____

d) Find the maximum value of the product.

When $x =$ _____ and $y =$ _____, the maximum value of product is _____.

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a) Show that $(x + 1)$ is a factor of $f(x)$ using the synthetic division.

b) Using (a) to factor $f(x)$ into four linear factors.

$$f(x) = \underline{\hspace{15em}}$$

c) Find all zeros (including complex zeros) of $f(x)$.

$$x = \underline{\hspace{15em}}$$

3. Solve $\frac{x+1}{3-x} \leq -2$ and express your answer in interval notation.

4. Let $f(x) = \frac{2x^2 - 2x}{1 - x^2}$.

a) Find the following (if none, write "none")

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3) hole(s): $x =$ _____ $y =$ _____

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x				
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