Final Exam, MAT172, Spring 2006

Professor Sormani

Write your name and email on top.

Part I: Short Answers (3 points each) *There are 15 short answers.*

1. Multiply $(x - 4)$ by $(x + 3)$.

2. What is the domain of $\sqrt{x + 2}$?

3. What is the minimum of $f(x) = (x - 3)^2 + 7$ and what value of x gives the minimum?

4. Let $f(x) = \sqrt{x}$ and let $g(x) = 3x + 1$, what is $f(g(x))$?

5. Solve $2^{(x-1)} = 8$.

6. Simplify $Ln(7 \cdot e^x)$.

7. If you borrow 200 dollars to your aunt for textbooks and pay her 4 percent interest compounded annually, how much do you owe her in two years?

8. Convert $135°$ to radians.

9. Suppose the terminal point of θ on the unit circle is $(-\sqrt{3}/2, -1/2)$. What is $cos(\theta)$?

10. Rewrite in terms of $sin(\theta)$ and $cos(\theta)$ and simplify:

$$\frac{sec(\theta)}{tan^2(\theta)} =$$

11. Find the vertical asymptotes of

$$f(x) = \frac{(x-5)}{(x^2 - 7x + 12)}$$

12. Solve $3^x > 27$.

13. If you borrow fifty dollars on a credit card with 16 percent interest compounded continuously, how much do you owe in three months?

14. $Arcsin(sin(3\pi/4)) =$. Be careful. First compute the sine!

15. Draw a quick sketch of $y = Ln(x)$ and $y = e^x$.

16. Evaluate $tan(\pi/3)$

Part II: Justified True and False (3 points each)

You must justify your answers or you get no points. All points are for the justification. There are five questions.

To show something is false, you can give an example, but to show something is true you need to work out the formulas.

1. The student writes $x^2 - 16$ divided by $x - 4$ is $x + 4$.

2. Let $f(x) = e^x$. Then $f(2 + h) = e^2 + e^h$.

3. A student writes: $cos(\pi + s) = cos(\pi) + cos(s)$.

4. The graph of $y = 5cos(4x)$ is a curve which starts at $(0, 5)$ curves downward to $(\pi/4, 0)$ continues down to a minimum at $(\pi/2, -5)$ then goes upward through $(3\pi/4, 0)$ to a second maximum at $(\pi, 5)$ and extends periodically in both directions with period π.

5. The function $cos : (-\infty, \infty) \to [-1, 1]$ has an inverse.

Part III: Long Answers

1. (10 points)

   Let

   $$f(x) = \frac{(x+4)^2}{(x^2-9)}.$$

   a) When is $f(x) = 0$?

   b) When is $f(x)$ undefined?

   c) What are the vertical asymptotes of $f(x)$?

   d) Write out the interval test to determine where $f(x)$ is positive or negative.

   e) Graph f(x).

2. (6 points)

Let $y = f(x)$ be the line of slope 2 which passes through $(1, 3)$.

a) Plot $y = f(x)$ on graph paper.

b) What is the formula for $f(x)$?

c) What is the y intercept? Check it algebraically.

d) What is the x intercept? Check it algebraically.

e) Where is $f(x) \geq 0$?

f) Put your answer to (e) on the x axis of your graph.

3. (6 points) Let $f(x) = x^2$ and $g(x) = x^2 - 9$ and $h(x) = x^2 + 9$.

a) Find the roots of all three functions.

b) Find the vertices of all three functions.

c) Plot all three functions on the same graph below and carefully label which is which.

4. (6 points) Given a triangle with sides of length $a = 30$, $b = 15$ and angle $\theta = 60°$ between them, what is the length of the side opposite θ? What are the other two angles? Use the law of cosines for one answer and the law of sines for another and draw the triangle.

5. (6 points) Let $f(x) = x^3 + 6x^2 + 11x + 6$.

   a) Divide $f(x)$ by $x + 1$ and then factor $f(x)$.

   b) Solve $f(x) = 0$.

   c) Find the roots of f.

6. (6 points) a) Add the vectors (1,2) and (3,4). Draw the tail tip description for this addition.

   b) Find the magnitude of $(3, 4)$.

   c) Find the unit vector in the direction of $(3, 4)$.