Math 1501L
Spring 2001
A. D. Andrew
Quizzes

Quiz 1. 17 January 2001

1. (4) Given that \( f(x) = x^2 \) and \( g(x) = x + 1 \), calculate the composition \( g \circ f \).

2. (6) Decide on intuitive grounds whether or not the indicated limit exists, and evaluate the limit if it does exist.
   
   a. \( \lim_{x \to 2} \frac{x^2 + 3x - 10}{x - 2} \)
   
   b. \( \lim_{x \to 2} \frac{x^2 + 3x - 9}{x - 2} \)

Quiz 2. 24 January 2001

1. (10) Sketched below is the graph of the function \( f(x) = -x^2 - 2x + 15 \). Find the equation of the line tangent to this graph at the point \((2, f(2))\) and draw this line on the sketch below.

![Graph of f(x) = -x^2 - 2x + 15](image)

Quiz 3. 29 January 2001

1. (4) Compute the derivative of \( f(x) = \frac{2x}{x+3} \).

2. (6) An object moves along a coordinate line, with its position at each time \( t \geq 0 \) given by \( x(t) = t^3 - t^2 - 4t + 4 \). Calculate the object's velocity, acceleration, and determine all time(s) when the velocity is 0.

Quiz 4. 14 February 2001

1. (10) Let \( f(x) = x^4 - 4x^3 + 4x^2 - 5 \).
   
   a. Find the critical numbers of \( f \).
   
   b. Use the 2nd derivative test to classify each critical number \( c \) as a local minimum or a local maximum.
   
   c. Compute the value \( f \) assumes at each critical number.
Quiz 5.  19 February 2001

1. a. (3) Sketch a rectangular box with a square base and label the edges.

   b. (7) What is the maximum volume for a rectangular box (square base, no top) made from 12 square feet of cardboard?

Quiz 6.  21 February 2001

1. (10) Find the intervals on which the graph of \( f(x) = \frac{x}{x^2 + 3} \) is concave up, the intervals on which the graph of \( f \) is concave down, and the points of inflection, if any.

Quiz 7.  14 March 2001

1. Evaluate

   a. (4) \( \int \left( x^2 - \sec^2(x) \right) dx \)  
   b. (6) \( \int_{-1}^{0} 3x^2 \left( 4 + 2x^3 \right)^2 \, dx \)

Quiz 8.  Omitted

Quiz 9.  9 April 2001

A certain species of bacteria is being grown in culture. The rate of growth of the bacterial population is proportional to the number present. If there were 1000 bacteria in the initial population and the number doubled after 45 minutes, how many bacteria will be present after

   a. 1½ hours?

   b. 2 hours?

Quiz 10.  11 April 2001

Evaluate \( \int x e^{5x} \, dx \)
Quiz 1. 17 January 2001

1. \( (g \circ f)(x) = x^2 + 1 \)

2. a. 7  
   b. Does not exist.

Quiz 2. 24 January 2001

\[ y = -6x + 19 \]

Quiz 3. 29 January 2001

1. \( f'(x) = \frac{6}{(x + 3)^3} \)

2. \( v = 3t^2 - 2t - 4, \ a = 6t - 2, \) and \( v = 0 \) when \( t = \frac{1}{3}(1 \pm \sqrt{13}) \), but only \( t = \frac{1}{3}(1 + \sqrt{13}) \geq 0 \).

Quiz 4. 14 February 2001

The critical numbers are 0, 1, and 2. There are local minima at 0 and 2. There is a local maximum at 1. \( f(0) = f(2) = -5, f(1) = -4. \)
Quiz 5. 19 February 2001

a. The edges of the base must be labeled the same. The height must be labeled differently.

b. Maximum volume is 4.

Quiz 6. 21 February 2001

\[ f''(x) = \frac{2x(x-3)(x+3)}{(x^2 + 3)^3} \], so the graph is concave up on \([-3,0]\) and on \([3, \infty)\).

The graph is concave down on \((\infty, -3]\) and on \([0, 3]\). The inflection points are \((-3, \mathcal{Y}), (0,0)\) and \((3, \mathcal{Y})\).

Quiz 7. 14 March 2001

a. \(\frac{2}{3} x^\mathcal{H} - \tan(x) + C\)  
b. \(u = 4 + 2x^3, \frac{28}{3}\)

Quiz 9. 9 April 2001

a. 4000  
b. \(P(t) = 1000e^{\frac{1}{5} \ln(2) t}, P(120) = 1000e^{\frac{1}{5} \ln(2)(120)} = 6350\)

Quiz 10. 11 April 2001

\(\frac{1}{5} x e^{5x} - \frac{1}{25} e^{5x} + C\)