Quiz 1. 28 August 2001

1. (10) Decide on intuitive grounds whether or not the indicated limit exists, and evaluate it if it does.

a. \[ \lim_{x \to 2} \left( \frac{x^2 - x - 2}{x^2 + x - 6} \right) \]

b. \[ \lim_{x \to -3} \left( \frac{x^2 - x - 2}{x^2 + x - 6} \right) \]

Quiz 2. 4 September 2001

1. (10) Either calculate the value of the indicated limit or explain why it does not exist. L’Hospital’s Rule may not be used.

a. \[ \lim_{x \to 0} \left( \frac{\sin(5x)}{2x} \right) \]

b. \[ \lim_{x \to 0} \left( \frac{\sin(x)}{x+3} \right) \]

c. \[ \lim_{x \to 0} \left( \frac{\sin(2x)}{\tan(3x)} \right) \]

Quiz 3. 11 September 2001

1. (6) Calculate the third derivative of \( f(x) = \frac{x}{x-2} \).

2. (4) Calculate the derivative of \( g(x) = \left( \frac{2x - 1}{1 - x} \right)^3 \)

Quiz 4. 27 September 2001

1. (7) Calculate the derivative (be sure to simplify your answer)

a. \( f(x) = x^2 e^{-2x} \)

b. \( g(t) = e^{-t} \sin(2t) \)

2. (3) Evaluate \( \lim_{n \to \infty} \left( \frac{n+2}{n} \right)^{3n} \)
Quiz 5. 2 October 2001

1. (10) For \( f(x) = 12x^5 + 15x^4 - 40x^3 \) find

   a. The intervals on which \( f \) increases.
   b. The intervals on which \( f \) decreases.
   c. The critical numbers of \( f \).

Quiz 6. 4 October 2001

Find the critical numbers (including endpoints) of

\[
f(x) = (x-1)(x-2)^2 \quad \text{on} \quad \left[0, \frac{9}{4}\right].
\]

Classify each extreme value (as a local minimum, or local maximum) and find the absolute maximum value and absolute minimum value assumed by \( f \) on the interval \( \left[0, \frac{9}{4}\right] \).

Quiz 7. 25 October 2001

Evaluate

1. (5) \( \int \frac{\sin(\sqrt{x})}{\sqrt{x}} \, dx \)  
2. (5) \( \int_{1}^{5} 3x\sqrt{x-1} \, dx \)

Quiz 8. 1 November 2001

The region \( R \) lies in the first quadrant and its boundaries are formed by the \( y \)-axis, and the parabolas \( y = x^2 \) and \( y = 48 - 2x^2 \). Sketch \( R \), and

a. Express the volume of the solid obtained by revolving \( R \) about the \( y \)-axis in terms of simple disk-method integral(s). Do not evaluate your integral(s).

b. Express the volume of the solid obtained by revolving \( R \) about the \( y \)-axis in terms of simple shell-method integral(s). Do not evaluate your integral(s).
Quiz 9. 15 November 2001

1. Compute \[ \int_{1}^{e} \sin(\ln(x)) \frac{1}{x} \, dx \]

2. Compute the derivative of \( f(x) = x^2 e^{-x^2} \)

3. Extra (exact answers, no decimals): At what points is the derivative of the function in problem 2 equal to 0?

Sample Quiz. 4 December 2001

There’s no quiz this week, but here are some practice problems for you. Express the following quantities in the form \( a + bi \) (no decimals):

1. \( \frac{1 + i}{1 - i} \)

2. \( 3e^{i2\frac{\pi}{3}} \)

3. All third roots of \(-8i\)

4. \( \left( \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}} i \right)^{84} \)
Answers

Quiz 1. 28 August 2001

1. a. $\frac{3}{5}$  
   b. Does not exist.

Quiz 2. 4 September 2001

1. a. $\frac{5}{2}$  
   b. 0  
   c. $\frac{2}{3}$

Quiz 3. 11 September 2001

1. $f^{(3)}(x) = -12(x - 2)^{-4}$  
2. $\frac{dg}{dx} = \frac{5(x - 1)^4}{(1 - x)^6}$

Quiz 4. 27 September 2001

1. a. $2x e^{-2x}(1 - x)$  
   b. $e^{-t}(2\cos(2t) - \sin(2t))$

2. $e^6$

Quiz 5. 2 October 2001

a. Increasing on $(-\infty, -2]$ and on $[1, \infty)$

b. Decreasing on $[-2, 1]$

c. Critical numbers -2, 0, 1.

Quiz 6. 4 October 2001

There are local minima at 0 and 2. There are local maxima at 4/3 and 9/4. The absolute maximum value is 4/27, assumed at 4/3, and the absolute minimum value is -4, assumed at 0.

Quiz 7. 25 October 2001

1. $-2 \cos(\sqrt{x}) + C$  
2. $\frac{272}{5}$
Quiz 8. 1 November 2001

a. \[ V = \pi \int_{0}^{4} y \, dy + \pi \int_{16}^{24} \left( 24 - \frac{y}{2} \right) \, dy \]

b. \[ V = 2\pi \int_{0}^{4} x (48 - 3x^2) \, dx \]

Quiz 9. 15 November 2001

1. 2  
2. \[ f'(x) = 2xe^{-x}(1 - x^2) \]  
3. 0, 1, -1

Sample Quiz. 4 December 2001

1. \[ i \]  
2. \[ \frac{3}{\sqrt{2}} - \frac{3}{\sqrt{2}} i \]  
3. \[ \sqrt{3} - i, 2, -\sqrt{3} - i \]  
4. -1