

Calc I - 3450:221
FINAL Fall 98

NAME _____
ROW _____

Show **ALL** your work.

1
150 Points

1. Find the average value of the function $f(x) = x^2 - 2x + 2$ over $x \in [-2, 1]$.

8 Points

2. SET UP integral(s) to find the area of the region bounded by $y = x$ and $y = -x - x^2$.

6 Points

14 Points

6. Consider the region bounded by the graphs of $y = x - 1$ and $x = (y - 1)^2$ for $y \geq 1$.

SET UP THE INTEGRAL(S) needed to find the volume of the solid of revolution formed by

revolving this region about the

a) x-axis (Set up the integral(s) for integration with respect to y.)

7 Points

b) x-axis (Set up the integral(s) for integration with respect to x.)

8 Points

c) line $x = 8$ (Indicate the method used.)

7 Points

d) line $y = -3$ (Indicate the method used.)

8 Points
30 Points

7. Evaluate $\int_1^4 \frac{x^3 - 2x + 3}{x\sqrt{x}} dx$.

7 Points

8. Evaluate $\int_{-4}^9 x^4(7 - 3x^5)^6 dx + \int_9^{-4} x^4(7 - 3x^5)^6 dx$.

7 Points

9. Evaluate $\int \frac{4x + 10\cos(5x)}{[x^2 + \sin(5x)]^3} dx$.

8 Points

22 Points

10. Evaluate $\int [x^3 + 7x \sec^2(2x^2)] dx$.

8 Points

11. Evaluate $\int_{-2}^{-1} x^2 \sqrt{x+2} dx$.

8 Points

16 Points

12. Evaluate $\lim_{n \rightarrow \infty} \sum_{i=1}^n \left(\frac{i}{n}\right)^7 \frac{1}{n}$.

7 Points

13. A solid has as its base the region in the plane bounded by $y = \sqrt{x}$, $x = 4$ and $y = -3x$. Each cross section perpendicular to the plane and parallel to the y -axis is a rectangle with height five times the length of the base which lies in the plane. SET UP integral(s) to find the volume of this solid.

7 Points

14 Points

14. Answer all of the questions below for $f(x) = \frac{x^2 + 1}{x^2 - 1}$.

- a) Find any vertical, horizontal, and slant asymptotes. Show all limits used.

6 Points

- b) Find the intervals where $f(x)$ is increasing/decreasing and identify any extrema.

6 Points

- c) Find the intervals where $f(x)$ is concave up/down and identify any points of inflection.

6 Points

18 Points

15. A water tank is in the shape of an inverted cone with radius 9 feet and depth 36 feet. If water is pouring into the tank at the rate of 5 cubic feet per minute, at what rate is the depth of the water changing when the water is 10 feet deep?

7 Points

16. Find the dimensions of the rectangle of largest area that can be inscribed in a circle of radius $\sqrt{2}$.

7 Points

14 Points