Math 11B
Calculus with Applications
Fall 1998, UCSC

Oct 26, 1998

TEST I

Time: 70min

1. Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^2 x \, dx$. (Hint: $\cos^2 x = \frac{1+\cos 2x}{2}$.)

2. Water leaks out of a tank at the rate of $3t^2\, gal/sec$. Suppose we have $8\, gal$ of water in the tank. When will the tank be empty?

3. By dividing the interval $[0, 1]$ into n equal segments show that:

$$n < \int_0^1 \frac{1}{t^2} dt.$$

What can you conclude about this integral?

4. On a certain planet, an ape throws a stone upward, at $80\, ft/sec$, and the stone reaches a maximum height of $100 ft$. What is the gravitational constant, g, on this planet?

5. Let f be a continuous function over the interval $[0, 1]$. Suppose that the average of f over the first half of this interval is 4, and the average of f over the second half is 2. What is the total average? Why?

6.(Extra Credit) Compute the area bounded by a circle of radius r. (Hint: (i) Recall the equation of the circle: $x^2 + y^2 = r^2$; (ii) obtain a function; (iii) write an integral; and (iv) find a substitution which reduces this integral to the one considered in the first problem.)

Each problem is worth 10 pts.

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