Math 131E Krantz

Fall, 2021

Practice Exam for Second Midterm

1. Calculate the definite integral

$$\int_3^5 \frac{(\ln x)^2}{x}\, dx\,.$$

2. A ladder 10 feet long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 4 ft./sec., how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 feet from the wall?

3. Calculate the indefinite integral

$$\int (\cos x)^3 \cdot \sin x\, dx\,.$$

4. The position of a particle moving along a straight line is give by $s(t) = t^2 - 6t - 6$. What is the total distance that the particle travels from $t = 1$ to $t = 6$? [*Hint:* Remember that the particle travels forward some of the time and backward some of the time. You must take this fact into account.]

5. Use calculus to calculate the volume of the sphere having radius 4 inches.

6. Given that

$$xy^2 + y^2 = 2x^2y\,,$$

use implicit differentiation to calculate dy/dx at the point $(1, 1)$.

7. Use calculus to sketch the graph of

$$y = 2x^3 - 3x^2 - 12x + 10 \ .$$

In particular, show where the graph is increasing and decreasing and show where it is concave up and concave down.

8. A farmer has 2400 feet of fencing and wants to fence off a rectangular field that borders a straight river. He needs no fence along the river. What are the dimensions of the field that has the greatest area?

9. What is the area between the curves $y = x^2 - 1$ and $y = -2x^2 + 8$?

10. The element Excitium has a half life of 20 days. A sample has mass 10 grams. Find the mass remaining after 30 days.