

In Class Exam 2 Review Math 152

1. Find each antiderivative.

a) $\int \frac{x^3 - 4x^2}{x^2 - 4x + 13} dx$ b) $\int \frac{1}{x(x+2)^2} dx$ c) $\int \frac{x^2 + 1}{(x^2 + 4)(x + 1)} dx$

2. Approximate $\int_0^2 4^x dx$ using

a) the trapezoidal rule and $n=4$. b) Simpson's rule and $n=4$.

3. The value of $\int_1^2 \frac{1}{x^2} dx$ is approximated

a) using the trapezoidal rule. How big must n be so that the error is less than or equal to 0.001?

b) using Simpson's rule. How big must n be so that the error is less than or equal to 0.00001?

4. Determine whether or not the integral converges.

a) $\int_1^{\infty} \frac{1}{x + \sqrt{x}} dx$ b) $\int_0^1 \frac{1}{x + \sqrt{x}} dx$ c) $\int_1^{\infty} \frac{1}{\sqrt{x} + x^2} dx$ d) $\int_1^{\infty} \frac{1}{x(x+1)} dx$ e) $\int_1^{\infty} xe^{-x} dx$

f) $\int_0^1 \frac{\ln x}{\sqrt{x}} dx$

5. #30 in Stewart A tank contains 1000L of pure water. Brine that contains 0.05 kg of salt per liter enters the tank at a rate of 5 L/min. Brine that contains 0.04 kg of salt per liter enters the tank at 10L/min. The solution is kept thoroughly mixed and drains at the rate of 15 L/min. How much salt is in the tank after t minutes? after 1 hour?

6. Solve the initial value problem $y' = x^2 y^2 + x^2 y$, $y(0)=2$.

7. Find all solutions to $xy' = x\sqrt{1+x^3} - 2y$.

8. A spiral is parameterized by $x = t^2 \cos t$ $y = t^2 \sin t$ $0 \leq t \leq 2\pi$. Find the length of the curve.

9. Find the surface area of a cone with base radius r and height h .

10. Find the surface area if a) $y = \frac{1}{3}x^3$, $0 \leq x \leq 2$, is rotated about the x -axis.

b) $y = \ln x$ $1 \leq x \leq e$, is rotated about the y-axis.

11. A rectangular tank has dimensions 2 ft by 3 ft and is 4 ft high and is full of water.

a) Find the hydrostatic pressure and force on the bottom of the tank.

b) Find the hydrostatic force on one vertical side which is 2 ft by 4 ft.

c) Find the hydrostatic force on one vertical side which is 3ft by 4 ft.

d) A rectangular plate is submerged diagonally from the top of one 2 ft side to the bottom of the other 2 ft side.

Find the hydrostatic force on the top surface of the plate. Assume the plate is 2 ft at the top and bottom.

12. Find the centroid of the region bounded by

a) $y = 8 - x^2$ $y = x^2$

b) $y = \sin x$ $y = \cos x$ $0 \leq x \leq \frac{\pi}{4}$