

## Math 1496 - Sample Test 3

1. Using  $n$  rectangles and the limit process, find the area under the given curve.

$$y = 3x - x^2 \text{ on } [1, 3]$$

2a. A manufacturer wants to design a box with an **open** top having a square base and an area of 27 sq. inches. What dimensions will produce a box with maximum volume?

2b. A rectangular dog pen is being built against the side of a house using 100 ft of fencing for the remaining 3 sides. What is the maximum area?

3. Find the area bound by the following curves

$$y = x^2 \quad y = 2 - x, \quad x = 0, \quad x, y \geq 0.$$

4. For the given  $y = f(x)$  function and point  $x = a$  calculate both  $dy$  and  $\Delta y$ .

$$(i) f(x) = x^2, \quad x = 2, \quad dx = \Delta x = .1$$

$$(ii) f(x) = x^3 - x + 1, \quad x = 1, \quad dx = \Delta x = .05$$

5. Evaluate the following

$$(i) \frac{d}{dx} \int_1^x \sin(t^2) dt \quad (ii) \frac{d}{dx} \int_x^{x^2} \sqrt{1+t^3} dt$$

6. Evaluate the following indefinite integrals

$$(i) \int \sec^2 x \tan x dx \quad (ii) \int \frac{e^{1/x}}{x^2} dx \quad (iii) \int \frac{x}{(x+1)^2} dx$$

$$(i) \int_1^5 x\sqrt{x-1} dx \quad (ii) \int_0^{\pi/4} \sin x \cos x dx \quad (iii) \int_0^3 \frac{x}{\sqrt{x^2+16}} dx$$