

MA 142-14, Honors Calculus II
2000

Final EXAM

Mon March 13,

Student's name _____

Be sure to show all your work.

Note: the exam is 70 points total, but will be graded based on 50. So, 20 extra points are for extra credit!

1. (4 pts) State the Fundamental Theorem of Calculus, both parts I and II.

2. (4 pts) A spring has natural length of 1 m. A force of 20 N is required to hold it stretched to a length of 2 m. How much work is required to stretch the spring from 2 m to 3 m?

3. (8 pts) Determine if the following integrals are divergent or convergent:

$$\int_3^{\infty} \frac{x^2 + 5}{\sqrt{3 + 2x + x^7}} dx$$

$$\int_0^2 \frac{2x}{x^2 - 2} dx$$

4. (4 pts) Find the area enclosed by the curves

$$y^2 = x \quad \text{and} \quad y = x - 2$$

5. (4 pts) Find the volume of the solid obtained by rotating the region bounded by the given curves about the y -axis:

$$y = x^4 \quad \text{and} \quad y^3 = x$$

6. (8 pts) Find the lengths of the following curves:

$$y = \frac{x^4}{8} + \frac{1}{4x^2}, \quad 1 < x < 2$$

$$x = 2t^3 \quad y = t^2 \quad 0 < t < 1$$

7. (8 pts) Find the centroid of the region bounded by the given curves (see the sketch). Assume the density be equal to one.

$$y = \sin x, \quad x = 0, \quad x = \pi/2, \quad y = 0$$

8. (8 pts) Evaluate the indefinite integral

$$\int \frac{e^x}{\sqrt{e^{4x} - e^{2x}}} dx$$

9. (6 pts) Evaluate the definite ingtegral

$$\int_0^{\pi/2} e^{-2x} \cos x \, dx$$

10. (6 pts) Evaluate the indefinite integral

$$\int \frac{\sin x \sin 2x}{\sqrt{\sin^2 x + 9}} dx$$

11. (10 pts) Evaluate the indefinite ingtegral

$$\int \frac{x + x^2}{\sqrt{3 - 2x - x^2}} dx$$

Your answer should contain no trigonometric functions!