

MATH 1500 D01/D02 Fall 2015

Assignment 5

Total Marks: 60

Due Date: Nov 21, 2015.

SHOW ALL WORK to get full marks.

Word problems should have sentence answers with units.

This assignment covers sections 4.7, 4.9, 5.1, 5.2, 5.3.

1. (6 points) A farmer with 700 ft of fencing wants to enclose a rectangular area and then divide it into four pens with fencing parallel to one side of the rectangle. What is the largest possible total area of the four pens?

2. (5 points) Find the point of the curve  $y = \sqrt{x-1}$  that is closest to the point  $(3, 0)$ .

3. (6 points) Find the most general antiderivative of the function.

(a)  $r(\theta) = \frac{3}{2}e^\theta - \csc^2 \theta + \cos(8\theta + 1)$

(b)  $g(t) = \frac{1+t-t^2}{\sqrt{t}}$

4. (5 points) A particle is moving with the given data. Find the position of the particle.

$$a(t) = e^{t-1} + \frac{1}{t^2} + 3, \quad s(1) = -1, \quad v(1) = 2$$

5. (5 points) Evaluate the integral by interpreting it in terms of areas.

$$\int_{-5}^5 (x-1) - \sqrt{25-x^2} \, dx$$

6. (3 points) If  $\int_0^2 f(x) \, dx = \pi$  and  $\int_0^2 g(x) \, dx = -3\pi$ , Find

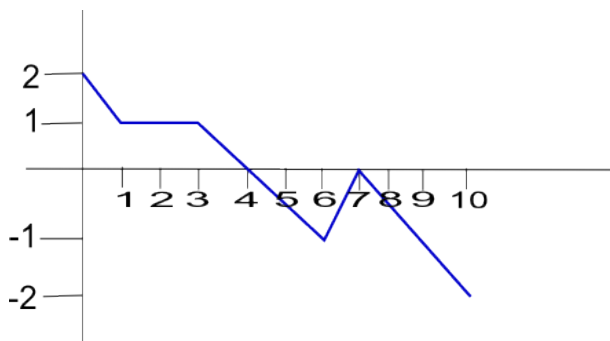
$$\int_0^2 \left[ f(x) + 2g(x) + \frac{\pi}{2} \right] \, dx$$

7. (8 points) Let  $g(x) = \int_0^x f(t) \, dt$ , where  $f$  is the function whose graph is shown.

(a) Evaluate  $g(1)$ ,  $g(4)$ ,  $g(7)$ , and  $g(10)$ .

(b) On what open interval is  $g$  decreasing?

(c) Where does  $g$  have a minimum value?



8. (8 points) Use Part 1 of the fundamental theorem of calculus to find the derivative of

$$y(x) = \int_{1-3\sin x}^{1+3\sin x} \frac{u^3}{1+u^2} \, du.$$

9. (6 points) Evaluate the integral of

$$\int_{-1}^3 y(y-1)(2y+1) \, dy.$$

10. (8 points) For the function

$$f(x) = x^3 - 2x^2 - 5x + 6 = (x-1)(x+2)(x-3),$$

compute the area bounded between  $f(x)$  and the x-axis. Include a rough sketch of the curve.