Name _____ Section _____

APPM 1350
Spring 2022

Exam 3

April 6

Instructions:

- This exam has four problems on pages numbered 1 through 9. Make sure you have all pages.
- Write your name and section number at the top of each page.
- Show all work and simplify your answers, except where the instructions tell you to leave your answer unsimplified.
- Name any theorem that you use and explain how it is used.
- Answers with no justification will receive no points unless the problem explicitly states otherwise.
- Notes, your text and other books, calculators, cell phones, and other electronic devices are not permitted, except as needed to upload your work.
-
-

Name _____ **Section** _____

1. (40 pts)

(a) Evaluate the integral if it exists.

i. $\int \frac{3x + 9}{x^2 + 6x}\, dx$

ii. $\int_{\frac{1}{2}}^{1} 2 \sin(\pi v) \cos(\pi v)\, dv$

iii. $\int_{-3}^{3} (|2x - 4| + 3x)$

Name _____ Section _____

(b)

$$\frac{1}{-\frac{3\pi}{4}}\int_{\frac{3\pi}{4}}^{\pi}\cos(2x-\ )\,dx = \frac{4}{-}\cdot\frac{1}{2}\sin(2x-\ )\Big|_{\frac{3\pi}{4}}^{\pi}$$

$$= \frac{2}{-}[0-1]$$

$$= -\frac{2}{-}$$

(c) Since g is odd $\int_{-5}^{5} g(x)\,dx = 0$.

$$\int_{-5}^{-2} g(x)\,dx + \int_{-2}^{0} g(x)\,dx + \int_{0}^{5} g(x) = 0$$

$$\int_{-5}^{-2} g(x)\,dx - 8 - 6 = 0$$

$$\int_{-5}^{-2} g(x)\,dx = 14$$

Name _____ **Section** _____

Name _____ **Section** _____

2. (12 pts)

A fence is to be built to enclose a rectangular area of 250 square feet. The fence along three sides is to be made of material that costs 6 dollars per foot. The material for the fourth side will cost 10 dollars per foot. Find the dimensions of the enclosure that minimize the cost of fencing material.

Solution:

Let x be the width and y be the length of the enclosed area, and suppose that one of the sides of length y costs \$10. The two equations we have are:

$$A = xy = 250 \qquad (1)$$

$$C = 6(2x)$$

Name _____ **Section** _____

3. (24 pts)

(a) Suppose an object moves with velocity $v(t) = 2t^2 - 12t + 16$ km/hr along a straight road.

i. Determine the displacement of the object on the time interval [1,3].

ii. Determine the distance traveled on the time interval [1,3].

(b) Apply Newton's method to the equation $x^3 + x - 5 = 0$: Use an initial guess of $x_0 = 1$ and find x_1: (Find only x_1:)

Solution: $x +$

(b) $f(x) = x^3 + x - 5$ and $f'(x) = 3x^2 + 1$.

$$\begin{aligned} x_1 &= x_0 - \frac{f(x_0)}{f'(x_0)} \\ &= 1 - \frac{1 + 1 - 5}{3 + 1} \\ &= 1 + 34 \\ &= \frac{7}{4} \end{aligned}$$

Name _____ Section _____

Name _____ **Section** _____

4. (24 pts)

(a) Evaluate the Riemann sum for $f(x) = x^2 - 3$ taking the sample points to be right endpoints, $a = -4$, $b = 2$ and $n = 6$.

(b) Express the integral $\int_{-4}^{2} x^2 - 3 \; dx$ as a limit of Riemann sums. You are not required to fully simplify this expression.

(c) Evaluate the expression that you gave in (b). Show all steps to find the limit of the Riemann sums.

Solution:

(a) With $a = -4;\ b = 2;\ n = 6,\quad x = \dfrac{2 - (-4)}{6} = 1$. We make a table:

Name _____ **Section** _____

Name