

Midterm 2 – Math 241

Tuesday, April 2, 2019

This is a closed-book exam. No calculators allowed.

Justify your answers to obtain full credit (and partial credit, too).

You have 75 minutes.

This exam consists of 7 questions.

All answers should be simplified unless otherwise stated.

Please verify that you have all pages.

Name: _____

ID#: _____

Section (circle one):

- Section 7: 9:30am-10:20am recitation (LA: Alison)
- Section 6: 10:30am-11:20am recitation (LA: Noe)

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1. (15 points) A particle's acceleration is given by $a(t) = 6t + 2$. Its velocity at 1 sec is -1 m/s. Its initial position is given by $s(0) = 5$. Find the position function $s(t)$.

2. (20 points) Consider the function $f(x) = x^3 - 6x^2 + 9x$

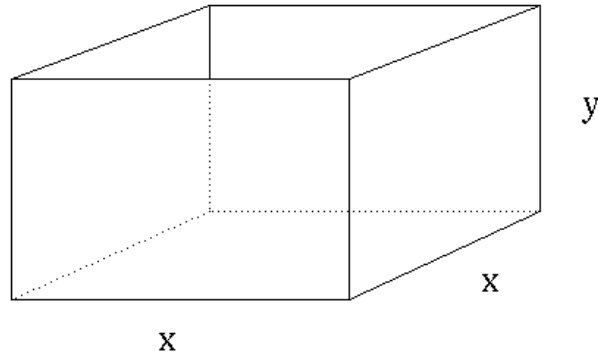
(a) Find the open intervals where f is increasing and the intervals where f is decreasing.

(b) Find both coordinates of any local extrema of the graph of f .

(c) Find the intervals where f is concave up, and the intervals where f is concave down.

(d) Find the both coordinates of any inflection point(s) of f .

3. (15 points) A box with a square base must have a volume of 8 in^3 . What are the dimensions of the box that will minimize the amount of material needed to build it (i.e. minimize surface area).



4. (15 points) Solve the following problems:

(a) $\int_0^{\pi/2} (\sin x + \cos x) dx$

(b) $\int_1^4 \left(\frac{1}{\sqrt{x}} + x \right) dx$

(c) $\frac{d}{dx} \int_0^{x^2} (2t + 1)^3 dt$

5. (*15 points*) A person leaves a given point and travels north at 3 mph. Another person leaves the same point at the same time and travels east at 4 mph. At what rate is the distance between the two people changing at the instant when they have traveled 2 hours?

6. (10 points) Approximate $\int_{-1}^1 (2x + 1) dx$ using 4 rectangles and right end points.
(No points for simply evaluating the integral)

7. (10 points) Show that $x^4 - 4x = 1$ has exactly one solution on $[-1, 0]$. Please state explicitly any theorems and how you are using them.

Final Score

	Score	Out of
Question 1		15
Question 2		20
Question 3		15
Question 4		15
Question 5		15
Question 6		10
Question 7		10
Total		100