Math 241
Spring 2018
Exam 2 - Practice
3/12/18
Time Limit: 50 Minutes

Name (Print): ________________________

Problem	Points	Score
1	20	
2	20	
3	20	
4	15	
5	20	
6	10	
7	20	
Total:	125	

1. (20 points) Use linearization to approximate $\sqrt{143}$ and $\sqrt[3]{124}$.

2. (a) (10 points) State Rolle's Theorem and the Mean Value Theorem.

(b) (10 points) Use the IVT and Rolle's Theorem (or the Mean Value Theorem) to show that $2x - \sqrt{2} = \cos^2(x)$ has one, and only one solution.

3. (20 points) Suppose that a particle has an acceleration function $a(t) = 12t^2 + 2t$. If the velocity function, $v(t)$ has the property that $v(1) = 1$, and the position function, $p(t)$, has the property that $p(1) = 0$, find explicit formulas for $v(t)$ and $p(t)$.

4. (15 points) a) Find the absolute extrema of $f(x) = x^{2/3}(x-6)$ on the interval $[-1, 5]$.

b) Find the absolute extrema of $f(x) = (x-3)^{2/3}$ on the interval $[2, 11]$.

c) Find the absolute extrema of $f(x) = \frac{x^3}{3} - 2x^2 + 3x$ on the interval $[0, 4]$.

5. (20 points) Consider the function $f(x) = \dfrac{x^2 - 1}{x^2 + 1}$.

   a) Determine the interval(s) where $f(x)$ is positive/negative.

   b) Find $\lim_{x \to \infty} f(x)$ and $\lim_{x \to -\infty} f(x)$. Give the equations of any asymptotes.

   c) Give the intervals of increase and decrease and give the coordinates of any local min/max (meaning the x and y values).

   d) Find the intervals of concavity and the coordinates of any inflection points.

6. (10 points) Sketch a graph of the function from the previous page. Label the asymptotes, extrema and inflection points.

7. (20 points) a) Find the radius and height largest right circular cylinder that can fit inside a sphere of radius 2.

b) What point on the graph of $f(x) = \frac{1}{\sqrt{x}}$ is closest to the origin?

c) You are to design a, quite large, square bottom box with total volume of 1500 $ft.^3$. The mysterious material you are to use costs 2 dollars per $ft.^2$ and you need to use two sheets of mysterious material on the bottom (this makes the box stronger). Find the dimensions and cost of the cheapest box you can make.