Math 221 Calculus 2
Professor Bacim Alali

Midterm 2
Fall 2018

Your name:_____

Rec. Instructor:_____ Rec. Time:_____

Show all your work in the space provided under each question. Please write neatly and present your answers in an organized way. You may use one sheet of notes, but no books, calculators, cell phones, or other electronic devices. This exam is worth 60 points. The chart below indicates how many points each problem is worth.

Problem	1	2	3	4
Points	/8	/6	/10	/12
Problem	5	6		Total
Points	/6	/18		/60

1. Find the arc length of the curve $y = \frac{1}{3}\left(2x - \frac{1}{3}\right)^{\frac{3}{2}}$ for $\frac{1}{6} \leq x \leq \frac{2}{3}$.

2. A force of 20 Newtons will stretch a spring 0.1 meters from its natural length. Find the work (in Newton-meter) required to compress the spring 0.2 meters from its natural length.

3. Find the centroid of the region under the curve $y = \cos(x)$, for $\frac{-\pi}{2} \leq x \leq \frac{\pi}{2}$.

4. Determine whether the sequence converges. If the sequence converges, calculate its limit.

(a) $\{a_n\}_{n=1}^{\infty}$, where

$$a_n = \left(1 + \frac{2}{n}\right)^{\frac{n}{3}}$$

(b) $\{c_n\}_{n=1}^{\infty}$, where

$$c_n = \frac{1}{n^2} + \sin(n)$$

5. Compute the sum of the series

$$\sum_{n=2}^{\infty} \frac{3^{n-1}}{4^{n-1}}$$

6. Determine whether the series converges; list each test of convergence.

(a)

$$\sum_{n=0}^{\infty} \frac{n^3 + 2n + 1}{2n^4 - n^2 + 3}$$

(b)

$$\sum_{n=2}^{\infty} \left| \cos\left(\frac{1}{n}\right) \right|$$

(c)

$$\sum_{n=1}^{\infty} \frac{n}{e^{n^2}}$$