MTH 151
Exam 2
Fall 2018

Show all work in a neat and organized fashion. Clearly indicate your answers.
100 points possible.

Graphing calculator OK but not one with CAS (e.g., no TI-89, no TInspire).

Sphere: $V = \frac{4}{3}\pi r^3$, $A = 4\pi r^2$ Cylinder: $V = \pi r^2 h$ Cone: $V = \frac{1}{3}\pi r^2 h$

$x_{n+1} = x_n - \dfrac{f(x_n)}{f'(x_n)}$ MVT: $f'(c) = \dfrac{f(b) - f(a)}{b - a}$

$\displaystyle\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$ $\displaystyle\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$ $\displaystyle\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$

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0. (2 pts.) Two free points.

1. (14 pts.) Use the Candidates Test (i.e., Closed Interval Method), showing all work, to find the absolute maximum and absolute minimum values of f on the given interval.

$$f(x) = 6x^4 + 8x^3 - 24x^2 + 1, \quad [-3, 3]$$

2. (14 pts.) The altitude of a triangle is increasing at a rate of 3 cm/min while the area of the triangle is increasing at a rate of 6 cm^2/min. At what rate is the base of the triangle changing when the altitude is 15 cm and the area is 200 cm^2?

3. (14 pts.) Consider the given function.

$$f(x) = x^3 - 9x^2 - 21x + 6$$

Use calculus methods, showing all work, to find the intervals of concavity for f and the inflection points of f (for the inflection points, find both x and y).

4. (14 pts.) Given:

$f(x) =$ unknown continuous function, with domain the set of all real numbers

$$f'(x) = \frac{8x}{9\sqrt[3]{x^2-25}}, \qquad f''(x) = \frac{8}{27\sqrt[3]{(x^2-25)^4}}$$

Use calculus methods, showing all work, to do the following.

(a) Find the intervals on which f is increasing or decreasing.

(b) Find the x-coordinates of all local maximum and local minimum points of f.

(You don't have to find the y-coordinates.)

5. (14 pts.) Find the most general antiderviative of the given function. In other words, find the indefinite integral $\int f(x)\,dx$.

(a) $f(x) = \dfrac{4+5x}{\sqrt{x}}$

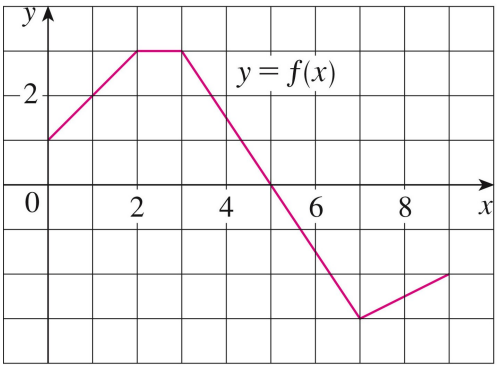
(b) $f(x) = \sqrt{x} + \cos x$

6. (14 pts.) Oil leaked from a tank at a rate of $r(t)$ liters per hour. The rate decraeased as time passed. Values of the rate at three-hour time intervals are shown in the table.

t (hr)	0	3	6	9	12	15
$r(t)$ (L/hr)	10.7	9.6	8.8	8.2	7.7	7.3

Use a Riemann sum with left endpoints and five subintervals to find an upper estimate of $\int_0^{15} r(t)\,dt$, the total amount of oil leaked out.

7. (14 pts.) The graph of f is shown.



Evaluate each integral by interpreting it in terms of areas.

(a) $\int_0^1 f(x)\,dx$

(b) $\int_0^7 f(x)\,dx$

(c) $\int_3^9 f(x)\,dx$