Name: _____

Instructions: All solutions should be prepared carefully and neatly. All solution sets shall be completed on this packet and submitted by uploading a scan or picture of your written work to D2L by 11:59 PM on the due date below. **Submit only a single pdf file of your entire packet. Desmos graphs can be submitted separately.** The mobile app called *Genius Scan* works well. Use a PENCIL and if you make a mistake, use an eraser. This assignment is graded on effort, completeness, and neatness for a total of 5 points. Careless presentation (e.g. bad handwriting, pen scribbles, doodles, wasted space, etc) will result in a deduction of points at my discretion. Submitted work that does not demonstrate clearly the process by which one arrived at the answer may result in a loss of points. Any parts to any questions that are not answered will also result in a loss of points. Academic dishonesty will not be tolerated.

Problem Set VII

MAT 181 – Calculus I

Due: Friday, April 26^{th} by 11:59 PM on D2L

Read: Sections 4.6, 4.7, 5.1, and 5.2

1. A poster is to contain 150 square inches of printed matter, surrounded by margins that are 3 inches wide on the top and bottom, and 2 inches on each side. Find the dimensions for the poster that minimizes the total area. Submit a Desmos graph of the objective function (after you eliminate the y variable) that confirms the minimum value of the function.

2. [This problem spans two pages.] Compute the general antiderivative of the following functions: [ ]

(a) $f(x) = 1$

(b) $f(x) = 3x^2$

(c) $f(x) = x^2 + \dfrac{1}{2}$

(d) $f(x) = x^{69420} + \dfrac{x}{2}$

(e) $f(x) = 0$

(f) $f(x) = -\dfrac{1}{x^2}$

(g) $f(x) = \dfrac{1}{1+x^2}$

(h) $f(x) = \dfrac{8}{1+x^2}$

(i) $f(x) = \dfrac{102}{\sqrt{1-x^2}}$

(j) $f(x) = \dfrac{6}{x}$

(k) $f(x) = \sqrt[5]{x^2}$

(l) $f(x) = \ln(10) \cdot 10^x$

(m) $f(x) = 10^x$

(n) $f(x) = (x+1)^2$

(o) $f(x) = (5x^2+1)(2+x^{-1})$

(p) $f(x) = \sin(x) - \cos(x) + \sec(x)\tan(x) - \csc^2(x)$

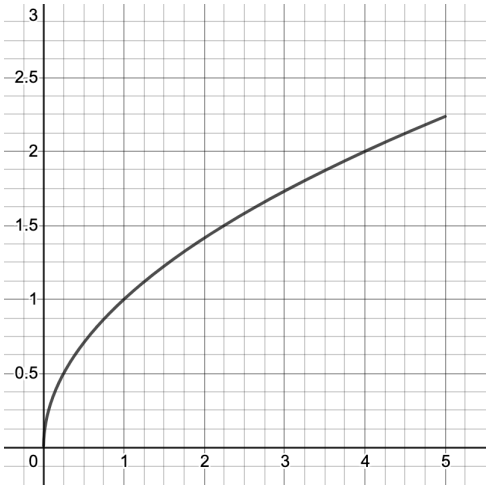
(q) $f(x) = e^{x+1}$

(r) $f(x) = \dfrac{4x^4 - 6x^2}{x}$, where $x \neq 0$

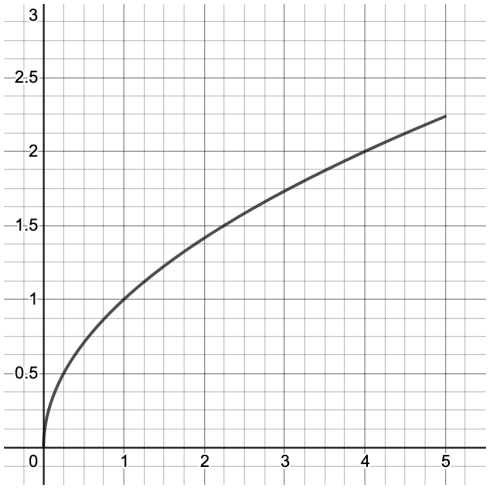
(s) $f(x) = \dfrac{\sin(x) - 1}{\cos^2(x)}$

3. For each problem below, sketch your rectangles on the graph provided and round your answers to 3 decimal places. Estimate the area under the graph of $f(x) = \sqrt{x}$ from $x = 0$ to $x = 5$ with $n = 10$ approximating rectangles using

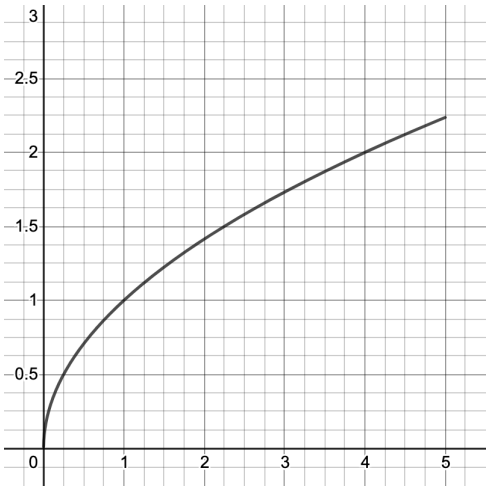
   (a) right endpoints.



   (b) left endpoints.



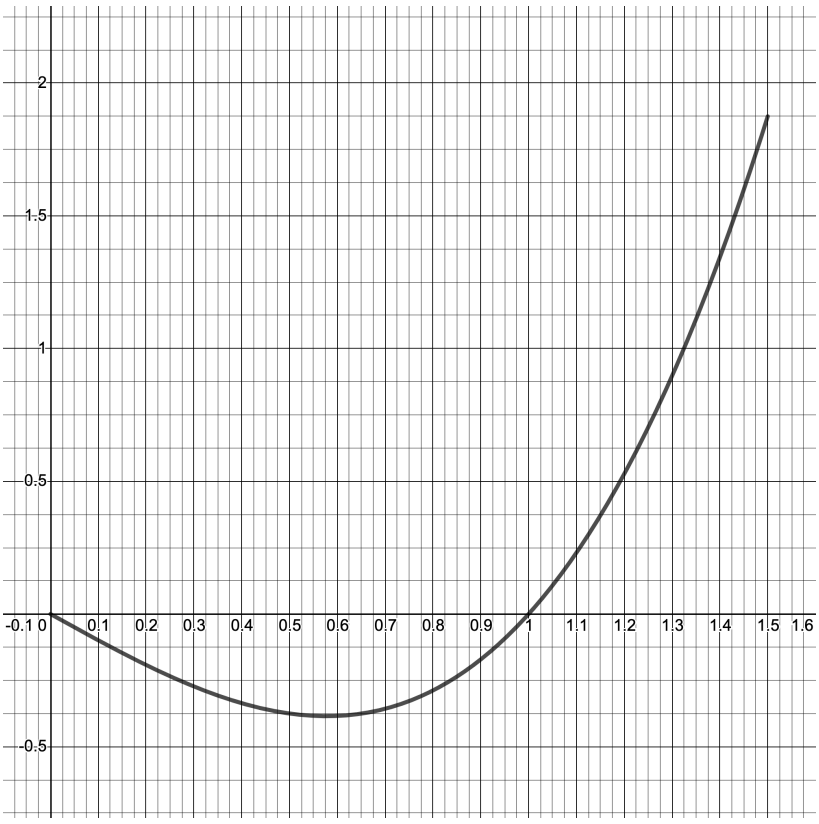
   (c) midpoints.



4. The graph of $f(x) = x^3 - x$ is shown below on the interval $[0, 1.5]$. Approximate the area "under" this curve using $n = 5$ rectangles. Instead of using the typical right-hand, left-hand, or midpoint rules, use the following sample points inside each interval to construct the height of the rectangles:

$$x_1^* = 0.2, \qquad x_2^* = 0.5, \qquad x_3^* = 0.7, \qquad x_4^* = 1, \qquad x_5^* = 1.4$$

Be sure to calculate Δx first and sketch your rectangles on the graph provided. If necessary, round your answers to 3 decimal places.



5. Application Problem: Suppose the acceleration function of an object moving along a line is given by $a(t) = 0.2t$. Find the position and velocity functions, denoted by $s(t)$ and $v(t)$ respectively, of the object if you know the initial velocity was $v(0) = -3$ and initial position was $s(0) = 1$. [(5)]