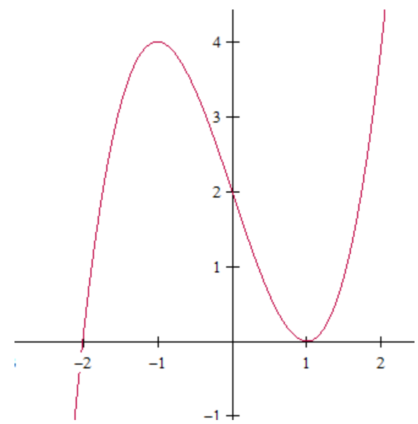
MSLC – Math 1151
Exam 3 Review

1. Sketch the graph of $2x^3 - 9x^2 + 20$ using your knowledge of the information obtained from the original function and the first and second derivatives. Be sure to indicate all important features. (Includes increasing, decreasing, max, min, concavity, intercepts, etc)
2. Find the area of the largest rectangle that can be inscribed in the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$
3. Suppose a rectangular box is to contain 10 cubic feet. The length of the box is to be twice the width. Material for the box costs \$2 per square foot for the bottom of the box, \$1 per square foot for the sides of the box and \$3 per square foot for the top of the box. Find the dimensions of the box that would minimize the cost.
4. Approximate $e^{0.1}$.
5. Determine whether the Mean Value Theorem applies to the following function on the following interval, and if so, find the point(s) guaranteed by the Mean Value Theorem.

   $y = 2x - \frac{5}{x}, \quad [3,6]$



6. Estimate the point(s) c guaranteed by the Mean Value Theorem in the graph to the right on the interval from [-2,2].
7. Find the following limits.

   a) $\lim_{x\to\infty} x^4 3^{-x^2}$ b) $\lim_{x\to\infty} \left(e^x + x\right)^{1/x}$

   c) $\lim_{x\to 0} \frac{5}{x^4} \ln\left(x^2\right)$ d) $\lim_{x\to 0} \left(\cot x - \frac{1}{x}\right)$
8. Find the most general antiderivatives of the following functions.

   a) $f(x) = x^2 - \frac{2}{x^5} + 20$

   b) $f(x) = 4\sec^2 x + \sin x$
9. Find the particular antiderivative of the following. $g(x) = \frac{x}{\left(3x^2\right)^3}, \; G(1) = 3$
10. Estimate the area under the curve $f(x) = x^2 + 3x$ on the interval [1,9] using 4 rectangles and right Riemann Sums. Draw a picture that illustrates the Riemann Sum you calculated.
11. Use the table of values below to evaluate the left Riemann Sum for the given function on the interval from [-5.3] using 4 rectangles.

x	-5	-4	-3	-2	-1	0	1	2	3
f(x)	4	2	1	0	5	7	6	3	-1

12. Given that $\int_1^5 f(x)dx = 7, \; \int_5^8 f(x)dx = -4, \; \int_1^4 f(x)dx = 11$, find $\int_4^8 \left(4f(x) + x\right)dx$