Sample Exam 1
Math 31, Spring 2010

1. (24 points) Compute the following. No explanation necessary, but show all your work. Please do not simplify any numerical answers.

(a) $\displaystyle\int (7x-9)^{317}\,dx$

(b) $\displaystyle\int \frac{x^3}{\sqrt{2x^4+7}}\,dx$

(c) $\displaystyle\int_0^1 \frac{e^{2x}}{e^{2x}+7}\,dx$

(d) Let $g(x) = \displaystyle\int_{-3}^{x} t^2 e^{t^2}\,dt$. Calculate $g'(x)$.

2. (10 points) Find the area of the region enclosed by the curves $y = 12x$, $y = x^3 - 4x$, $x = 1$, and $x = 3$. No explanation necessary, but show all your work, and do not simplify your final numerical answer.

3. (12 points) Mooninite Iggy is moving back and forth along the x axis at a velocity of $v(t) = \cos(3t+7)$ units per second. If at time $t = 0$, he is 5 units to the right of the origin (i.e., he is at position $r(0) = 5$), what is his position at time $t = 4$? Show all your work, and do not simplify your final numerical answer.

4. (16 points) Consider the solid obtained by rotating the region bounded by the curves $x = -2$, $x = 3$, $y = x^2 + 1$, and $y = 0$ around the x-axis.

(a) Sketch the region, the solid, and a typical disk or washer.

(b) Find the volume of the solid.

No explanation necessary, but show all your work, and please do not simplify your final numerical answer.

5. (18 points) Let $f(x)$ be a **DECREASING** function described by the following table.

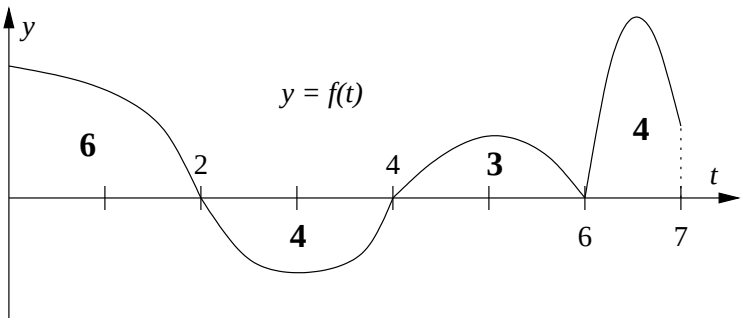
x	2.0	2.2	2.4	2.6	2.8	3.0	3.2
$f(x)$	4.9	4.7	4.4	3.7	3.6	3.3	3.1

(a) Use three rectangles to compute the R_3 estimate (sample points are right endpoints) of the integral $\displaystyle\int_2^{3.2} f(x)\,dx$. No explanation necessary, but show all your work.

(b) Is your answer in part (a) greater than the actual value of $\displaystyle\int_2^{3.2} f(x)\,dx$, or less than the actual value of $\displaystyle\int_2^{3.2} f(x)\,dx$? Briefly **explain** your answer, using the graph of $f(x)$. (In particular, sketch the graph of $f(x)$.)

(c) Use three rectangles to compute the midpoint estimate of the integral $\int_2^{3.2} f(x)\,dx$. No explanation necessary, but show all your work.

6. (20 points) Below is the graph of a function $f(t)$ (not drawn to vertical scale). Each region between the graph of $f(t)$ and the t-axis is labelled with a large boldface number that gives the area of that region.



Let $g(x) = \int_0^x f(t)\,dt$.

(a) At which value(s) of x, $0 < x < 7$, does $g(x)$ have a local maximum? Justify your answer in **ONE** sentence.

(b) What is the **maximum** value that $g(x)$ takes for $0 \le x \le 7$ (i.e., what is the maximum possible $y = g(x)$ for $0 \le x \le 7$), and at what value(s) of x is this maximum value attained? Briefly **justify** your answer.