Instructions: Your homework is in two parts, which you should turn in separately. This is not the same as the week 8 course packet homework. There are too many differences to list them all here; just print out this and use it instead of the course packet homework.

Due Wednesday, November 22, in lecture.

Week 8 Homework Problems, part A
1  Stewart, section 8.1: #1, 2, 9, 15, 23 (omit calculator part), 30
2  Stewart, section 8.3: #23, 25, 29, 32

Week 8 Homework Problems, part B
3  Let $k$ be greater than 1.
   a) Write a definite integral for the arclength of $y = x^k$ from $x = 0$ to $x = b$. Do not try to solve the integral.
   b) One case when this integral can be easily evaluated is when $k = \frac{3}{2}$. In that case use a substitution to evaluate the integral and find a formula for the arclength in terms of $b$.
   c) Use an inverse trig substitution to find a formula for the arclength in the case when $k = 2$.
   d) Use Simpson’s Rule with 6 sub-intervals to estimate the arclength in the case when $k = 3$ and $b = 1$.

4  Consider a uniform flat plate bounded by the graph of $y = 1/(1 + x^2)$, the graph of $y = -1/(1 + x^2)$ and the $y$-axis. Show that the plate has finite mass, but does not have center of mass at a finite distance. (This means that you could lift up the plate, but you could not balance it!)

5  Find the $x$-coordinate of the center of mass of the uniform flat plate bounded by the $x$- and $y$-axes, the line $x = 2$ and the curve $y = \frac{1}{\sqrt{x^2 + 6x + 13}}$. 
The formula for the arc length of a curve given parametrically by \((x(t), y(t))\), for \(a \leq t \leq b\), is

\[
L = \int_{a}^{b} \sqrt{(x'(t))^2 + (y'(t))^2} \, dt.
\]

A path of a point on the edge of a rolling circle of radius \(R\) is a cycloid, given by

\[
\begin{align*}
  x(t) &= R(t - \sin t) \\
  y(t) &= R(1 - \cos t)
\end{align*}
\]

where \(t\) is the angle the circle has rotated.

Find the length of one “arch” of this cycloid, that is, find the distance traveled by a small stone stuck in the tread of a tire of radius \(R\) during one revolution of the rolling tire.