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.

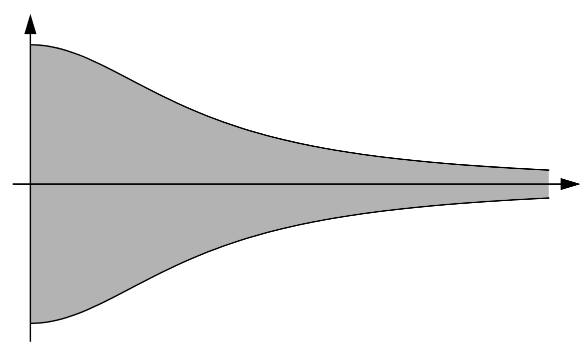
a) Write a definite integral for the arclength of $y = x^k$ from $x = 0$ to $x = b$. Do not try to solve the integral.

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.

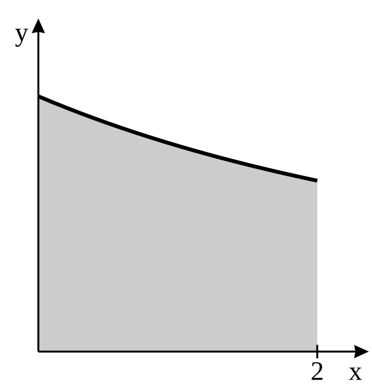
c) Use an inverse trig substitution to find a formula for the arclength in the case when $k = 2$.

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 $y = \dfrac{1}{\sqrt{x^2+6x+13}}$.



6 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

$$x(t) = R(t - \sin t)$$
$$y(t) = R(1 - \cos t)$$

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.