1 Stewart, section 7.8: #1, 3, 7, 9, 13, 19, 28, 29, 31, 64, 69, 70

2 Stewart, section 8.1: #1, 2, 9, 11, 12, 17, 24 (omit calculator part), 25 (omit calculator part)

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 The formula for the arc length of a curve given parametrically by $(x(t), y(t))$, for $a \le t \le b$, is

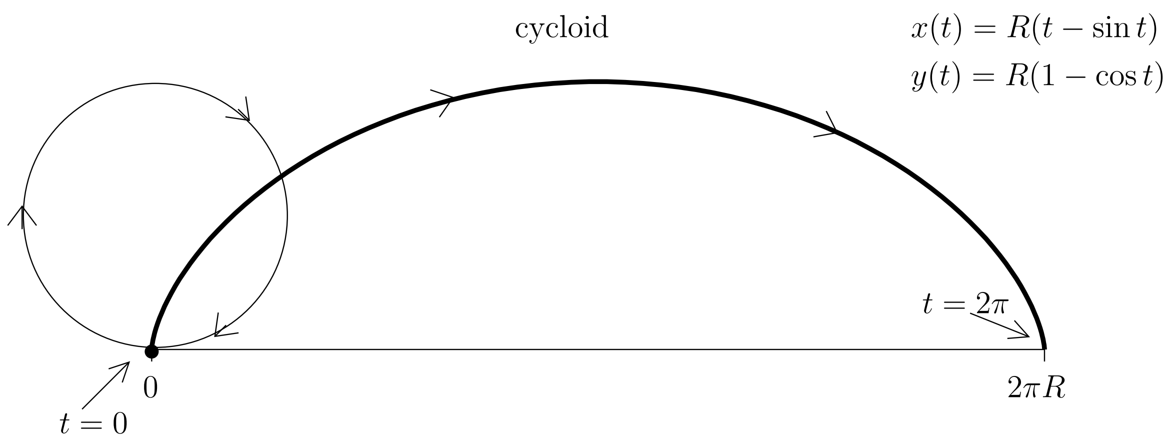
$$L = \int_a^b \sqrt{(x'(t))^2 + (y'(t))^2}\, dt.$$

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.



5 The rocket in Problem 3 of Week 4 required the following force when the rocket was at a distance of x from the center of the moon:

$$F(x) = \frac{R^2 P}{x^2} \text{pounds.}$$

a) The total amount of work done raising the payload from the surface (an altitude of 0, so $x = R$) to an altitude of R ($x = 2R$) is

$$W = \int_a^b F(x)\,dx = \int_R^{2R} \frac{R^2 P}{x^2}\,dx = \underline{\hspace{10em}} \text{ mile-pounds.}$$

b) How much work will be needed to raise the payload from the surface of the moon to the "end of the universe"?