Instructions: Your homework is in two parts, which you should turn in separately. This is **not** the same as the week 9 course packet homework: it is shorter. It is missing problem 3 (the exercises from Section 9.4), it is missing "worksheet" problems 5 and 6, and there are fewer exercises assigned from sections 9.1 and 9.3.

Due Wednesday, November 29, in lecture.

Week 9 Homework Problems, part A

1 Stewart, section 9.1: #1, 2, 4, 5, 7, 9

2 Stewart, section 9.3: #1, 2, 3, 9, 11, 12, 38, 39

Week 9 Homework Problems, part B

4 Suppose you drop a stone of mass m from a great height in the earth's atmosphere, and the only forces acting on the stone are the earth's gravitational attraction ($g \approx 9.8 m/s^2$) and a retarding force due to air resistance, which is proportional to the velocity v. Then, since $F = ma$ and $a = \frac{dv}{dt}$, we have the differential equation $m\frac{dv}{dt} = mg - kv$ (where k is some constant).

a) Find v as a function of time t.

b) Calculate $\lim_{t\to\infty} v(t)$, the terminal velocity of the stone.

7 A person borrows \$10,000 and repays the loan at the rate of \$2400/year. The lender charges interest of 10%/year. Assuming that payments are made continuously and interest is compounded continuously (a pretty good approximation to reality for long-term loans), the amount of money owed t years after the loan is made, $M(t)$, then satisfies

$$\frac{dM}{dt} = \tfrac{1}{10}M - 2400, \qquad M(0) = 10000.$$

a) Solve this differential equation for $M(t)$.

b) How long does it take to pay off the loan? That is, at what time t is $M(t) = 0$?