Exam #1 Answer Key

1. (a) No: the R&D expenditure is a sunk cost. If it spent twice as much or half as much to discover the drug, it should still charge the same price, because that's the price that maximizes profit.

   (b) The only time that R&D costs affect the company's behavior is *before* they're sunk: when the company is thinking about spending money on R&D, it has to determine whether or not it's going to be profitable to make that investment given their estimate of how much they'll be able to charge for the pill. Once they do the R&D, however, it's a sunk cost and will no longer influence their profit-maximizing decisions.

2. We have $n = 0.1$ and $i = 0.04$. The rule of thumb is $r \approx n - i = 0.1 - 0.04 = 0.06$, i.e., a real interest rate of about 6%. Using the actual formula we solve $1 + r = \frac{1+n}{1+i}$ to get $r \approx 5.76\%$.

3. (a) Plug $1000, 0.13, and 30 years into the annuity formula to get a present value of about $749.57 for benefits. Since the present value of costs is $1000, the costs are greater than the benefits.

   (b) The interest rate needs to go down. Lower interest rates will increase the present value of the benefits without increasing the present value of the costs. Alternatively, you can imagine borrowing the $1000 and having to pay it back plus interest. The lower the interest rate, the easier it will be for you to pay back the money with the revenues generated by the power plant.

   (c) Plug $100 and 0.13 into the present value of a perpetuity formula to get $769.23.

   (d) Put $769.23 in the bank at 13% interest and each year you'll get $100 in interest. By "living off the interest", you can generate payments of $100 at the end of each year forever with an initial investment of only $769.23.

4. (a) Drivers who move out of slow lanes and into fast lanes slow down the fast lanes and speed up the slow lanes, thereby equalizing traffic speed in the different lanes.

   (b) These economists argue that "you can't beat the market" (formally, this is called the efficient market hypothesis) and therefore that you should invest in an index fund that buys a little bit of everything. The idea here is that this sort of passively managed fund will have lower management costs than an actively managed fund that tries to beat the market.

5. (a) The expected values are $(.0001)(\$1000000) + (.9999)(\$0) = \$100$ and $(1)(\$1000) = \$1000$.

   (b) There is a very low probability that your vote will influence the outcome of the election, so the expected value from thinking about who to vote for can be very low even though the decision itself is very important.

6. (a) $(0.1)(0) + (.98)(105) = 102.9$.

(b) To maximize your present value you need to compare the return you'll get from "investing in the trees" with the return you'll get from investing in the bank. Investing in the bank means cutting down the trees and putting the proceeds in the bank. Investing in the trees means letting the trees grow so there will be more lumber next year.

(c) The real interest rate has to be lower than 2.9%.