Math 241
Review sheet for Exam #1

The exam will cover

- Sections 1.1–1.5 (Linear functions and linear regression)
- Sections 9.1–9.3 (Quadratic, exponential, and logarithmic functions)
- Sections 10.4–10.6 (Average rate of change and derivatives).

Here are some extra practice problems. You should also review the homework problems assigned on the above sections.

1. You own a store that sells widgets. If you price them an $10 each, then you sell 100 in a week. At 15 dollars each, you only sell 70 in a week. Assuming the demand function is linear, determine an equation for demand in terms of price.

2. Determine the regression line for the data points $(1, 2)$, $(2, 1)$, $(3, -1)$. On the exam, you will be given the formulas for the regression coefficients.

3. Consider the data points $(0, 1)$, $(1, 1.2)$, and $(4, 2.2)$. Which of the lines

$$y = 0.3x + 1.1 \qquad \text{and} \qquad y = 0.4x + 0.9$$

is the better fit, in terms of giving the smaller sums-of-squares error?

4. You have a store that sells super-widgets, and the demand function is $q = -5p + 1200$. Write down the function expressing revenue in terms of price, and determine what price will maximize your revenue.

5. Find the exponential function which passes through the two points $(3, 5)$ and $(10, 6)$.

6. You invest $1000 in an account earning 4 percent interest per year, compounded twice a year. How long will it take for your account to have $1500 in it?

7. Repeat the above question but assuming that the interest is compounded continuously.

8. The half-life of substance X is 100 years. Given an initial amount of this substance, how long will it take for only one-fifth of the substance to be left?

9. Find the average rate of change of the function $f(x) = \frac{1}{x+1}$ over the interval $[1, 10]$.

10. Let $f(x) = 3x^2 - x$. Algebraically compute a formula for $f'(a)$, showing all your steps.

$$f'(a) = \lim_{h \to 0} \left[\frac{3(a+h)^2 - (a+h) - [3a^2 - a]}{h} \right] = \lim_{h \to 0} \left[\frac{3a^2 + 6ah + 3h^2 - a - h - 3a^2 + a}{h} \right]$$

$$= \lim_{h \to 0} \left[\frac{6ah + 3h^2 - h}{h} \right]$$

$$= \lim_{h \to 0} [6a + 3h - 1]$$

$$= 6a - 1.$$

11. Let $f(x) = x^2 - x$. Find the equation for the tangent line of f at the point $x = 3$.