MATH 101 CHEAT SHEET

This packet is not meant to go over everything that we have done in the course but rather to summarize a lot of information. In fact, you'll notice that I did not mention **composition and inverses of functions** here, yet I would highly recommend studying these. Please make sure to do the practice finals on canvas and in the workbook. **It is impossible to learn/understand math without doing math; this includes writing all your work down!**

1. Functions

(1) A **function** is a relationship between two variable in which every input has exactly one output.

(2) A function is generally written as $f(x)$, where x is our input variable and $f(x)$ is our output variable. As an example, we write $f(3) = 5$ to say that "when we plug in 3 into the function $f(x)$, the output is 5".

(3) The **domain** of a function is the set of values we are allowed to plug into the function. Think: the x-values we can plug in.

(4) The **range** of a function is the set of values we can get out of the function. Think: the y-values we can get out.

(5) The **average rate of a function** $f(x)$ **on the interval** $[a, b]$ is given by

$$\frac{f(b) - f(a)}{b - a}.$$

2. Types of Functions

(1) A **linear function** is a function of the form $y = mx + b$, where $m = \frac{\text{change in } y}{\text{change in } x}$ is the slope (average rate of change) of the line and $(0, b)$ is the $y-$intercept.
(2) An **exponential function** is a function of the form $y = ab^t$, where a is called the **initial value** and b is called the **growth factor**. Often we consider $r = 1 - b$, which we call the **growth rate**.

3. Linear Functions

(1) **Point-Slope Form:** Given a point (x_0, y_0) on a line with slope m, the equation of the line is $y = m(x - x_0) + y_0$.
(2) **Slope-intercept Form** A line with slope m and y-intercept $(0, b)$ is given by the equation $y = mx+b$.

4. Exponential Functions/ Compound Growth

(1) Here are some properties of exponents:
   (a) $a^x \cdot a^y = a^{x+y}$.
   (b) $\frac{a^x}{a^y} = a^{x-y}$.
   (c) $(a^x)^y = a^{xy}$.
   (d) $a^0 = 1$.
(2) The amount accumulated in an account bearing interest **compounded n-times per year** is given by

$$A(t) = P_0 \left(1 + \frac{r}{n}\right)^{nt},$$

noindent where P_0 is the principal (initial) value, r is the nominal interest rate, and t is the number of years.

(3) **CAUTION!** The growth factor of $A(t) = P_0 \left(1 + \frac{r}{n}\right)^{nt}$ is $\left(1 + \frac{r}{n}\right)^n$ **not** $\left(1 + \frac{r}{n}\right)$

(4) The effective annual rate of an account bearing interest r and compouded n-times per year is given by

$$\left(1+\frac{r}{n}\right)^n - 1$$

(5) The amount accumulated in an account bearing interest **compounded continuously per year** is given by

$$C(t) = P_0 e^{rt},$$

where P_0 is the principal (initial) value, r is the continuous interest rate, and t is the number of years.