

## MATH 1030: Midterm 2 Study Guide

The following is an overview of the material that will be covered on the first exam.

### 1. Simple and Compound Interest

- Know how to do computations with simple interest
- Know the compound interest formula for an account that compounds  $n$  times per year.

$$A = P \left(1 + \frac{APR}{n}\right)^{nY}$$

- Know the compound interest formula for an account that compounds continuously

$$A = Pe^{APR \cdot Y}$$

- Know how to compute the APY given the APR for an account. If the account is compounded  $n$  times per year, then  $APY = \left(1 + \frac{APR}{n}\right)^n - 1$ . If the account is compounded continuously, then  $APY = e^{APR} - 1$ .

### 2. Savings and Loan

- You do *not* need to memorize the savings plan formula, but you do need to know how to use it:

$$A = PMT \times \frac{\left(1 + \frac{APR}{n}\right)^{n \cdot Y} - 1}{\frac{APR}{n}}$$

- You do *not* need to memorize the loan payment formula, but you do need to know how to use it:

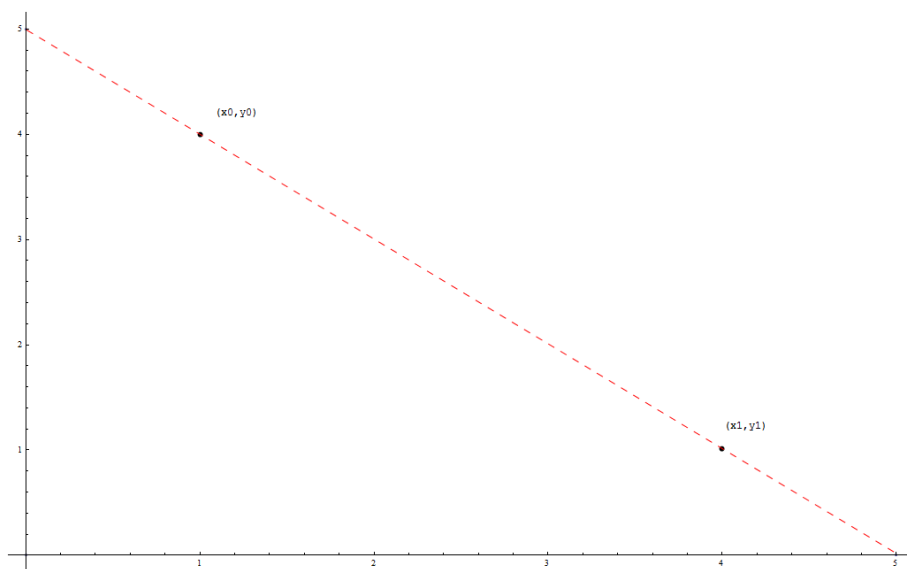
$$PMT = P \times \frac{\frac{APR}{n}}{1 - \left(1 + \frac{APR}{n}\right)^{-n \cdot Y}}$$

### 3. Linear vs. Exponential Growth/Decay

- Determine whether a given situation is described by linear or exponential growth.
- Find the domain and range of a given function.

### 4. Linear Models

- Differentiate between the independent and dependent variables in a situation.
- Find the slope/rate of change.
- Graph linear functions.
- Find the  $y$ -intercept.
- Find the equation of a line given an initial value and a rate of change. This is the point-slope formula. It is  $y = mx + b$ .
- Find the equation of a line given two points on the line. If the given points are  $(x_0, y_0)$  and  $(x_1, y_1)$ , then you need to first calculate the rate of change (i.e., slope) which is given by the formula  $m = \frac{y_1 - y_0}{x_1 - x_0}$ . This formula is difficult to remember because it's easy to get the indices mixed up, it's easy to forget if the  $x$ 's should be in the numerator or denominator, etc. For me, it's easier to graph the two points, and then find the slope by calculating  $\frac{\text{rise}}{\text{run}}$  as shown here:



Now if we write down

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_1 - y_0}{x_1 - x_0}$$

Once we have the slope, we use the point-slope formula for a line:  $y - y_0 = m(x - x_0)$  where  $(x_0, y_0)$  is any point on the line and  $m$  is the slope.

## 5. Exponential Models

- Equation for exponential growth, given a growth/decay rate.

$$Q = Q_0(1 + r)^t$$

- Equation for exponential growth, given the doubling time or half-life.

$$Q = Q_0 \cdot 2^{t/T_2} \quad \text{and} \quad Q = Q_0 \left(\frac{1}{2}\right)^{t/T_{1/2}}$$

- Find the doubling time or half-life, given a growth/decay rate,  $r$ .