

CHAPTER ONE

PREREQUISITES FOR CALCULUS

1. LINES

- A. Delta (Δ) means *change in*. It must be attached to something.
- B. Definition of slope
- C. Parallel and perpendicular slopes
- D. Different ways to represent lines
 - Slope-intercept: $y = mx + b$
 - Standard (general linear equation) $Ax + By = C$
 - Point-slope $y - y_1 = m(x - x_1)$ or $y = m(x - x_1) + y_1$
- E. Regression on the calculator
 - How to do it - starting with linear
 - Correlation coefficients - the good, the bad, and the negative
- F. Assignment: P.7 {2 - 35 do 2, skip 2; 36 - 40, 43}

2. FUNCTIONS AND GRAPHS

- A. Definition of a function
- B. Associated definitions
 - Domain, Range, Dependent Variable, Independent Variable
- C. Various types of functional notation
- D. Interval notation
- E. Various types of graphs that should be familiar (or soon will be)
 - linear, quadratic, polynomial, powers, piecewise defined,
 - roots, exponential, log, rational, trig, absolute value, greatest integer
- F. Composite Functions
- G. Manipulating functions: Consider $y = f(x)$
 - 1) $y = f(x - h)$ shifts h units horizontally
 - 2) $y = f(x) + k$ shifts k units vertically
 - 3) $y = A \cdot f(x)$ stretches vertically by a factor of A
 - 4) $y = f(Bx)$ shrinks horizontally by a factor of B
 - 5) $y = -f(x)$ reflects through the x -axis
 - 6) $y = f(-x)$ reflects through the y -axis
 - 7) $y = |f(x)|$ flips those portions below the x -axis up
 - 8) $y = f(|x|)$ keeps the right side and flips it through the y -axis
 - 9) $y = f^{-1}(x)$ reflects through $y = x$
- H. Odd and Even functions
- I. Assignment: P.17 {2 - 35 do 2, skip 2; 37 - 42, 46, 47, 49, 55 - 62}

3. EXPONENTIAL FUNCTIONS

- A. Exponential functions have a variable in the exponent.
- B. The two basic types: growth and decay
- C. The basic rules for exponents should be familiar
- D. Modeling using the calculator
- E. Writing equations from information:

$$\text{For } y = a \cdot b^{\frac{t}{c}}, \text{ } a = \text{amount at time zero, } b = \text{growth factor}$$

$c = \text{time period for the growth factor}$
 $1 + r = b$ where r is the growth rate
if $b > 1$ ($r > 0$) then we have growth
if $b < 1$ ($r < 0$) then we have decay

- F. Solving equations using intersection

- G. Solving equations using logarithms (which is section five)
- H. The number e
- I. Formulas for money

$$A = p\left(1 + \frac{r}{n}\right)^{(n*t)} \qquad A = p \cdot e^{(r*t)}$$

- J. More regression with these puppies.
- K. Assignment: P. 24 { 1 - 10, 15, 18, 24 - 37 do 2, skip 2; 38 }

4. PARAMETRIC EQUATIONS

- A. Recall that in a function we usually write y in terms of x.
- B. In a parametric equation each of x and y are written in terms of t. t is the independent variable (and we must consider it's interval). x and y are dependent.
- C. Examples of where we use parametric equations (and how they look on the calculator): Baseball, Inverses, Conic sections, lines (in any space).
- D. Converting from parametric to functional/cartesian notation. If you know what it is, go ahead and convert. If you don't know what it is, solve the x portion for t and substitute this in for y. ** Sometimes this requires fancy trigonometry **
- E. Parametrizing a line segment: anchor off of one point and use the slope.
- F. Assignment: P. 30 { 1 - 4, 7 - 25 odd (sketch and convert), 27 + 28 }

5. FUNCTIONS AND LOGARITHMS

- A. One-to-one functions. What they are, what they look like, how they are defined.
- B. Inverse functions.
 1. Find them by switching x and y and solving for y
 2. Since every x and y are switched, the domains and ranges are as well
 3. We can graph them parametrically, they are symmetric with the original w.r.t. $y = x$
 4. $f(f^{-1}(x)) = f^{-1}(f(x)) = x$
 5. The inverse will be a function if the original is one-to-one
- C. Logs are inverses of exponential functions. Be able to convert between them.
- D. Properties of logarithms (Big three and Little two)
 1. $\log_b M + \log_b N = \log_b MN$
 2. $\log_b M - \log_b N = \log_b \frac{M}{N}$
 3. $\log_b M^P = P \log_b M$
 4. $a^{\log_a x} = x$ or $e^{\ln x} = x$
 5. $\log_a a^x = x$ or $\ln e^x = x$
- E. The change of base theorem
- F. Applications and solving
- G. Modeling
- H. Assignment: p.39 { 1-12, 15-36 multiples of 3, 37+38, 46-49 }

6. TRIGONOMETRIC FUNCTIONS

- A. Definitions of radians, arc lengths, and the six trigonometric functions
- B. The values of the trigonometric functions at multiples of 30 and 45 degrees
- C. Periodicity of the trig functions.
- D. Solving trigonometric functions for friendly and unfriendly values.
- E. Transforming trigonometric graphs of the form: $y = A \text{ Trig } (B(x - c)) + D$
- F. Modeling data into a sinusoidal function
- G. The inverse trigonometric functions: domains, ranges, and graphs.
- H. Assignment: P.48 { 1-20 minus the multiples of 4, 25-32, 34-36 }