

# FINAL EXAM FORMULA SHEET

## Math171 - Mathematical Models

### Exponent Notation

$$x^{-1} = \frac{1}{x}$$

$$\sqrt[n]{x} = x^{\frac{1}{n}}$$

### Exponent Laws

$$A^n A^m = A^{n+m}$$

$$(A^n)^m = A^{nm}$$

$$\frac{A^n}{A^m} = A^{n-m}$$

$$(AB)^n = A^n B^n$$

$$\left(\frac{A}{B}\right)^n = \frac{A^n}{B^n}$$

### Linear Equations

$$y = mx + b$$

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

### Quadratic Functions

$$y = ax^2 + bx + c$$

$$x\text{-coordinate of vertex } x = \frac{-b}{2a}$$

### Quadratic Equation

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

### Trigonometry

$$\sin x = \frac{\text{opp}}{\text{hyp}} = \frac{y}{h}$$

$$\cos x = \frac{\text{adj}}{\text{hyp}} = \frac{x}{h}$$

$$\tan x = \frac{\text{opp}}{\text{adj}} = \frac{y}{x}$$

$$\csc x = \frac{1}{\sin x}$$

$$\sec x = \frac{1}{\cos x}$$

$$\cot x = \frac{1}{\tan x}$$

$$\frac{180^\circ}{\pi} \quad 1^\circ = \frac{\pi}{180^\circ}$$

### Basic Definition of Logarithm

$$\text{If } y = b^x \text{ then } \log_b y = x$$

$$\text{If } y = e^x \text{ then } \ln y = x$$

$$\text{If } y = 10^x \text{ then } \log y = x$$

$$\log_b b^x = x$$

$$\ln e^x = x$$

$$\log 10^x = x$$

### Logarithm Laws

$$\log_b (XY) = \log_b X + \log_b Y$$

$$\log_b \left(\frac{X}{Y}\right) = \log_b X - \log_b Y$$

$$\log_b X^n = n \log_b X$$

### **Exponential Decay-Growth Formulas**

$Y = Y_0 e^{kt}$  where  $Y_0$  is the initial amount of  $Y$  and  $t$  is time

### **Newton's Law of Heating and Cooling**

$T = T_s + (T_o - T_s)e^{kt}$  where  $T_s$  is temperature of the surroundings

$T_o$  is initial temperature of the object

$T$  is the temperature after  $t$  amount of time

### **Complex Numbers**

$$j = \sqrt{-1} \quad j^2 = -1$$

Rectangular Form:  $x + yj$

Polar Form:  $r(\cos \theta + j \sin \theta)$

Exponential Form:  $re^{\theta j}$