TMTH 135
FINAL EXAM FORMULA SHEET

CHAPTER 1: *Numerical Computation*

Distance = Rate × Time (where rate is in decimal form)

Amount = Rate × Base (where rate is in decimal form)

$$\%\ \text{change} = \frac{\text{New Value - Original Value}}{\text{Original Value}} \times 100$$

$$\%\ \text{error} = \frac{\text{Measured Value - Known Value}}{\text{Known Value}} \times 100$$

$$\%\ \text{efficiency} = \frac{\text{Output}}{\text{Input}} \times 100$$

$$\%\ \text{concentration of A} = \frac{\text{Amount of A}}{\text{Total Amount of Mixture}} \times 100$$

CHAPTER 2: *Algebra*

$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$

$$(a - b)(a + b) = a^2 - b^2$$

Given nonzero real numbers x and y, and integers m and n:

$x^1 = x$ $\qquad$ $x^0 = 1$ $\qquad$ $x^{-n} = \frac{1}{x^n}$

$(x^m)^n = x^{mn}$ $\qquad$ $x^m \cdot x^n = x^{m+n}$ $\qquad$ $\frac{x^m}{x^n} = x^{m-n}$

$(xy)^n = x^n y^n$ $\qquad$ $\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$ $\qquad$ $\left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$

CHAPTER 7: *Right Triangles and Vectors*

1 rev = 360° = 2π radians 1 radian = 57.3° $c^2 = a^2 + b^2$

$$\sin\theta = \frac{opp}{hyp} \qquad \cos\theta = \frac{adj}{hyp} \qquad \tan\theta = \frac{opp}{adj}$$

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

CHAPTER 11: *Determinants (For a system of two linear equations)*

Second Order Determinant: $\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = a_1 b_2 - a_2 b_1$

General Form of System of Two Linear Equation:

$$a_1 x + b_1 y = c_1$$
$$a_2 x + b_2 y = c_2$$

Cramer's Rule: $x = \dfrac{\begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}}$ and $y = \dfrac{\begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}}$

CHAPTER 14: *Quadratic Equations*

General Form of a Quadratic: $ax^2 + bx + c$

Quadratic Formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

CHAPTER 15: *Oblique Triangles and Vectors*

$\sin\theta = \sin(180° - \theta)$ $\cos\theta = \cos(360° - \theta)$ $\tan\theta = \tan(180° + \theta)$

Law of Sines: $\dfrac{\mathrm{a}}{\sin(\mathrm{A})} = \dfrac{\mathrm{b}}{\sin(\mathrm{B})} = \dfrac{\mathrm{c}}{\sin(\mathrm{C})}$

Law of Cosines:

$a^2 = b^2 + c^2 - 2bc\cos(A)$ $\quad \cos(\mathrm{A}) = \dfrac{b^2+c^2-a^2}{2bc}$

$b^2 = a^2 + c^2 - 2ac\cos(B)$ $\quad \cos(\mathrm{B}) = \dfrac{a^2+c^2-b^2}{2ac}$

$c^2 = a^2 + b^2 - 2ab\cos(C)$ $\quad \cos(\mathrm{C}) = \dfrac{a^2+b^2-c^2}{2ab}$

CHAPTER 16: *Radian Measure, Arc Length and Rotation*

Central Angle: $\boldsymbol{\theta = \dfrac{s}{r}}$

Arc Length: $\boldsymbol{s = \theta r}$ (where $\boldsymbol{\theta}$ is in radians)

CHAPTER 19: *Ratio, Proportion and Variation*

Direct Variation: $y = k\,x$ or $\dfrac{y_2}{y_1} = \dfrac{x_2}{x_1}$

Inverse Variation: $y = \dfrac{k}{x}$ or $\dfrac{y_2}{y_1} = \dfrac{x_1}{x_2}$

Joint Variation: $y = k\,x\,w$

Power Function: $y = k\,x^{\,b}$ *where*

For b = 2: $y = k\,x^{\,2}$

For b = 3: $y = k\,x^{\,3}$

For b = - 2: $y = \dfrac{k}{x^2}$