TMTH 111
FINAL EXAM FORMULA SHEET

CHAPTER 1: *Numerical Computation*

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

$$\%\ change = \frac{new\ value - original\ value}{original\ value} \times 100 \qquad \%\ error = \frac{Measured\ Value - Known\ value}{Known\ value} \times 100$$

$$\%\ efficiency = \frac{output}{input} \times 100 \qquad \%\ conc.\ of\ A = \frac{Amount\ of\ A}{Total\ Amount\ of\ Mixture} \times 100$$

Metric Prefixes:

10^{12}	10^{9}	10^{6}	10^{3}	10	1	10^{-1}	10^{-2}	10^{-3}	10^{-6}	10^{-9}	10^{-12}
tera	giga	mega	kilo	deca	Unit: m, gr, L	deci	centi	milli	micro	nano	pico

CHAPTER 5: *Graphs*

$$y = mx + b \qquad m = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$

CHAPTER 6: *Geometry*

NAME	FORMULA
Circle	Circumference = $2\pi r$ or πd
	Area = πr^2 or $\frac{\pi d^2}{4}$
Square	Perimeter = $4s$
	Area = s^2
Rectangle	Perimeter = $2(l + w)$
	Area = lw
Parallelogram	Perimeter = $2(a + b)$
	Area = bh
Rhombus	Perimeter = $4s$
	Area = sh

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NAME	FORMULA
Trapezoid	Perimeter = $a + b + c + d$
	Area = $\frac{(a+b)h}{2}$
Triangle	Area = $\frac{bh}{2}$
Hero's Formula	Area = $\sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$
Cube	Volume = a^3
	Surface Area = $6a^2$
Rectangular Parallelepiped	Volume = lwh
	Surface Area = $2(lw + hw + lh)$
Any cylinder or prism	Volume = (area of base) (altitude)
Right cylinder or prism	Lateral Area = (perimeter of base) (altitude) (not including bases)
Sphere	Volume = $\frac{4}{3}\pi r^3$
	Surface area = $4\pi r^2$
Any cone or pyramid	Volume = $\frac{h}{3}$ (area of base)
Right circular cone or regular pyramid	Lateral area = $\frac{s}{2}$ (perimeter of base)
Frustum	Volume = $\frac{h}{3}$ $(A_1 + A_2 + \sqrt{A_1 A_2})$
Frustum	Lateral area = $\frac{s}{2}$ (sum of base perimeters) $= \frac{s}{2}(P_1 + P_2)$

CHAPTER 7: ***Right Triangles and Vectors***

$1 \text{ rev} = 360° = 2\pi \text{ radians}$ $\quad 1 \text{ rad} \approx 57.3°$ $\quad c^2 = a^2 + b^2$

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

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

CHAPTER 9: ***Fractions and Fractional Equations***

Distance = speed × time $\quad$ *Amount of work = rate of work × time*

CHAPTER 15: ***Oblique Triangles and Vectors***

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

Law of Sines: $\frac{\text{a}}{\sin\text{A}} = \frac{\text{b}}{\sin\text{B}} = \frac{\text{c}}{\sin\text{C}}$

Law of Cosines: $a^2 = b^2 + c^2 - 2bc\cos A$ $\quad \cos\text{A} = \frac{b^2+c^2-a^2}{2bc}$

$b^2 = a^2 + c^2 - 2ac\cos B$ $\quad \cos\text{B} = \frac{a^2+c^2-b^2}{2ac}$

$c^2 = a^2 + b^2 - 2ab\cos C$ $\quad \cos\text{C} = \frac{a^2+b^2-c^2}{2ab}$

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

$1 \text{ rev} = 360° = 2\pi \text{ radians}$

Area of a Sector: $A = \frac{r^2\theta}{2}$ (where θ is in radians)

Area of a Segment: $A = r^2\cos^{-1}\left(\frac{r-h}{r}\right) - (r-h)\sqrt{2rh - h^2}$ (where $\cos^{-1}\left(\frac{r-h}{r}\right)$ is in radians)

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

CHAPTER 19: ***Ratio, Proportion and Variation***

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

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

Joint Variation: $y = k\,x\,w$ **Power Function:** $y = k\,x^{\,b}$

CHAPTER 22: *Analytic Geometry*

Straight Line

Distance formula. $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Equation of Straight line (General Form) $Ax + By + C = 0$

Equation of Straight line (Slope-Intercept Form) $y = mx + b$

Equation of Straight line (Point-slope Form) $m = \frac{y - y_1}{x - x_1}$

or $y - y_1 = m\,(x - x_1)$

Equation of Straight line (Two-point form) $\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$

Intersection angle between two lines $\tan\phi = \frac{m_2 - m_1}{1 + m_1 m_2}$

Circle

Circle of Radius r and Centre at (h,k) (Standard Equation) $(x - h)^2 + (y - k)^2 = r^2$

Parabola

Vertex at Origin and Horizontal Axis (Standard Equation) $y^2 = 4px$

Vertex at Origin and Vertical Axis (Standard Equation) $x^2 = 4py$

Focal Width L = |4p|

Ellipse

Centre at Origin and Vertical Major Axis (Standard Equation) $\frac{y^2}{a^2} + \frac{x^2}{b^2} = 1$

Centre at Origin and Horizontal Major Axis (Standard Equation) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Distance from centre to focus. $c = \sqrt{a^2 - b^2}$

(*Note*: $a = \sqrt{c^2 + b^2}$ and $b = \sqrt{a^2 - c^2}$)

Focal width (where *a* is semi-major axis) $L = \frac{2b^2}{a}$