Meet 4: Cheat Sheet

Event A: Algebraic Manipulation

- **Factoring:**

$$x^3+y^3=(x+y)(x^2-xy+y^2)$$

$$x^3-y^3=(x-y)(x^2+xy+y^2)$$

- **Rational Exponents:**

$$\sqrt[3]{x^2}=x^{2/3},\quad x^{-2}=\frac{1}{x^2}\ \&\ \frac{1}{y^{-2}}=y^2$$

- **Simplify Radical Expressions:**

Ex: $\sqrt{xy}\cdot\sqrt[3]{xy^2}=(x^{1/2}y^{1/2})\cdot(x^{1/3}\cdot y^{2/3})$

$=x^{5/6}y^{7/6}$

$=\sqrt[6]{x^5y^7}$

- **Solve Equations:** (Including Radicals & Quadratics)

Ex: $x+\sqrt{x+4}=2$

$\sqrt{x+4}=2-x$

$x+4=4-4x+x^2$

$0=x^2-5x$ → $x(x-5)=0$

$x=0,\ x=5$

But, 5 doesn't work.

$\therefore x=0$

- **Functional Notation:** If $f(x)=x^2+5x+3$

Then,

$f(-2)=(-2)^2+5(-2)+3$

$=4-10+3$

$=-3$

$f(k+2)=(k+2)^2+5(k+2)+3$

$=k^2+4k+4+5k+10+3$

$=k^2+9k+17$

- **Sum, Product & Quotient of Rational Expressions.**

Event C: Miscellaneous Topics

- **Arithmetic:** Add the Same Amount

Sequence: $a,\ a+d,\ a+2d,\ \ldots$

$t_n=a+d(n-1)$

Series: $a+(a+d)+(a+2d)+\cdots$

$S_n=\frac{n}{2}(a_1+a_n)$

$=\frac{n}{2}(2a+d[n-1])$

- **Geometric:** Multiply by the Same Amount

Sequence: $a,\ a\cdot r,\ a\cdot r^2,\ \ldots$

$t_n=a\cdot r^{n-1}$

Series: $a+ar+ar^2+\cdots$

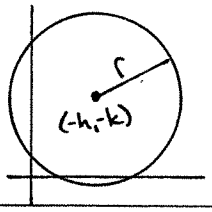
$S_n=\frac{a(1-r^n)}{1-r}$

$S_\infty=\frac{a}{1-r}$

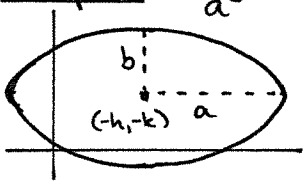
- **Binomial Theorem:** $(a+b)^n=\binom{n}{0}a^nb^0+\binom{n}{1}a^{n-1}b^1+\binom{n}{2}a^{n-2}b^2+\cdots+\binom{n}{n-1}a^1b^{n-1}+\binom{n}{n}a^0b^n$

Event D: Conic Sections

- **Circle:** $(x+h)^2+(y+k)^2=r^2$



- **Ellipse:** $\frac{(x+h)^2}{a^2}+\frac{(y+k)^2}{b^2}=1$

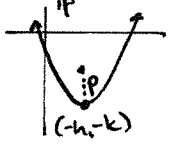


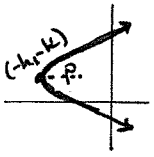
Distance from Center to Foci:

$c=\sqrt{|a^2-b^2|}$

- **Parabola:** $y+k=\frac{1}{4p}(x+h)^2$

where "p" is the distance from Vertex to Focus

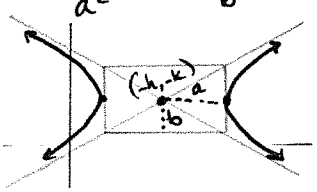




$x+h=\frac{1}{4p}(y+k)^2$

- **Hyperbola:**

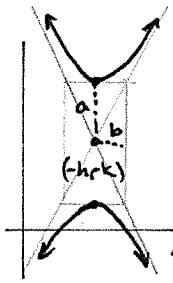
$\frac{(x+h)^2}{a^2}-\frac{(y+k)^2}{b^2}=1$



Asymptotes:

$y+k=\pm\frac{b}{a}(x+h)$

$\frac{(y+k)^2}{a^2}-\frac{(x+h)^2}{b^2}=1$



Distance From Center to Foci:

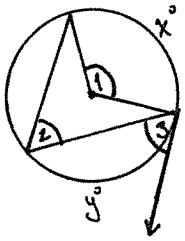
$c=\sqrt{a^2+b^2}$

Asymptotes:

$y+k=\pm\frac{a}{b}(x+h)$

Event B: Circular Figures & Solids

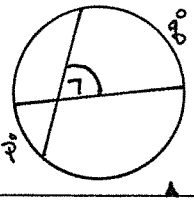
• Central, Inscribed, Tangential & Exterior Angles:



$\angle 1$ is a Central Angle: $m\angle 1 = x^\circ$

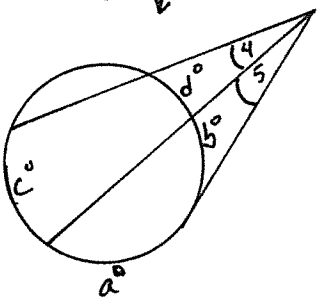
$\angle 2$ is an Inscribed Angle: $m\angle 2 = \frac{1}{2}x^\circ$

$\angle 3$ is a Tangential Angle: $m\angle 3 = \frac{1}{2}y^\circ$



$\angle 7$ is an Interior Angle:

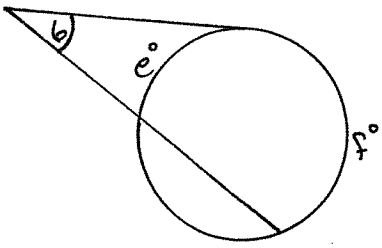
$$m\angle 7 = \frac{p^\circ + q^\circ}{2}$$



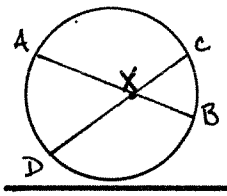
$\angle 4$, $\angle 5$ & $\angle 6$ are Exterior Angles:

$$m\angle 4 = \frac{a^\circ - b^\circ}{2} \qquad m\angle 6 = \frac{f^\circ - e^\circ}{2}$$

$$m\angle 5 = \frac{c^\circ - d^\circ}{2}$$



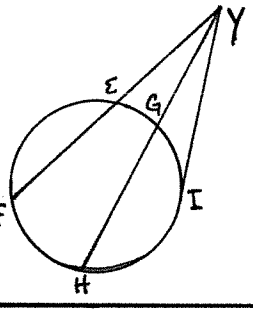
• Chords:



$\overline{AB}$ & $\overline{CD}$ are Chords:

$$(AX)\cdot(XB) = (CX)\cdot(XD)$$

• Secants & Tangents:



$\overline{YF}$ & $\overline{YH}$ are Secants:

$$(YE)\cdot(YF) = (YG)\cdot(YH)$$

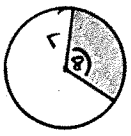
$\overline{YI}$ is a Tangent:

$$(YI)^2 = (YE)\cdot(YF) = (YG)\cdot(YH)$$

• Areas:

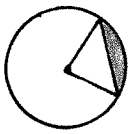
Entire Circle: $A = \pi r^2$

Sector:



$$A = \frac{m\angle\theta}{360^\circ}\cdot\pi r^2$$

Segment:



$$A = A_{sector} - A_{Triangle}$$

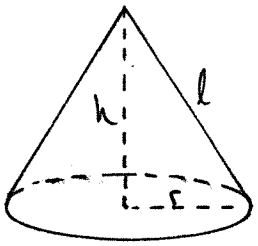
• Cones:

Volume:

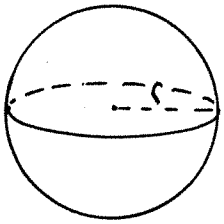
$$V = \frac{1}{3}\pi r^2 h$$

Surface Area:

$$SA = \pi r^2 + \pi r \cdot l$$



• Spheres:



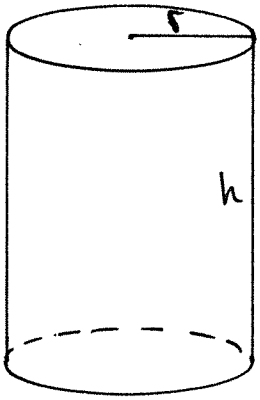
Volume:

$$V = \frac{4}{3}\pi r^3$$

Surface Area:

$$SA = 4\pi r^2$$

• Cylinders:



Volume:

$$V = \pi r^2 \cdot h$$

Surface Area:

$$SA = \pi r^2 + 2\pi r \cdot h$$