End-of-Course Assessment Algebra II Reference Sheet

Binominal Theorem

$$(a+b)^n = a^n + \frac{n}{1!}a^{n-1}b^1 + \frac{n(n-1)}{2!}a^{n-2}b^2 + \frac{n(n-1)(n-2)}{3!}a^{n-3}b^3 + \ldots + b^n$$

$$(a+b)^n = {}_nC_n a^n + {}_nC_{n-1}a^{n-1}b^1 + {}_nC_{n-2}a^{n-2}b^2 + {}_nC_{n-3}a^{n-3}b^3 + \ldots + {}_nC_0 b^n$$

Standard Form of a Quadratic Equation

$$ax^2 + bx + c = 0$$

Quadratic Formula

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

(where $ax^2 + bx + c = 0$, $a \neq 0$)

Compounding Interest Formulas

Periodic: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Continuous: $A = Pe^{rt}$

(where A is the amount due on a principal P invested for t years at an annual interest rate r compounded n times per year)

Combination and Permutation Formula

Combination:

$${}_nC_r = C(n, r) = \frac{n!}{(n-r)!\,r!}$$

Permutation:

$${}_nP_r = P(n, r) = \frac{n!}{(n-r)!}$$

Sequences and Series

Arithmetic sequence: $a_n = a_1 + (n-1)d$

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

Geometric sequence: $a_n = a_1 r^{n-1}$ or $a_n = a_{n-1}r$

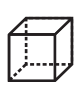
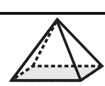
Geometric series: $S_n = \frac{a_1 - a_1 r^n}{1 - r}$, where $r \neq 1$

(where a_1 is the first term, n is the number of the term, d is the common difference, r is the common ratio, a_n is the nth term and S_n is the sum of the first n terms)

General Formula for Growth and Decay

$A = A_0 e^{kt}$ (where A is the amount at the time t, A_0 is the amount at $t = 0$, and k is a constant)

$e \approx 2.718$

Figure	Formulas for Volume (V) and Surface Area (SA)	
Rectangular Solid 	$V = l \times w \times h$ = length × width × height $SA = 2 \times l \times w + 2 \times w \times h + 2 \times h \times l$	
Cylinder (total)	$V = \pi r^2 h = \pi$ × square of radius × height $SA = 2\pi rh + 2\pi r^2$ $SA = 2 \times \pi \times$ radius × height + $2 \times \pi \times$ square of radius	$\pi \approx 3.14$
Sphere	$V = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times$ cube of radius $SA = 4\pi r^2 = 4 \times \pi \times$ square of radius	
Cone	$V = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \pi \times$ square of radius × height	
Pyramid 	$V = \frac{1}{3}Bh = \frac{1}{3} \times$ area of base × height	
Prism 	$V = Bh$ = area of base × height	

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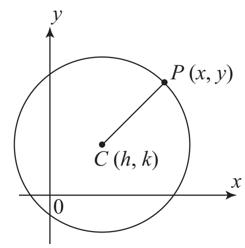
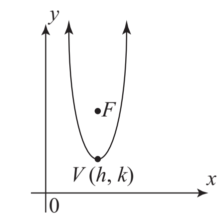
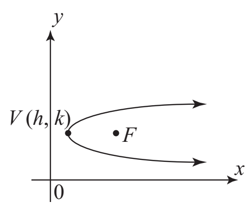
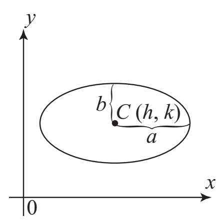
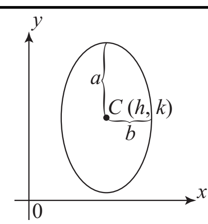
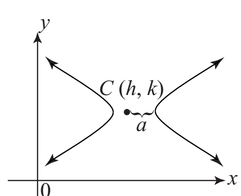
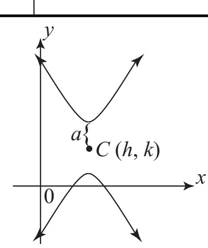
Conic Section		Equation	Characteristics
Circle		$(x-h)^2+(y-k)^2=r^2$	Center (h, k) radius r
Parabola		$y=a(x-h)^2+k$	axis of symmetry $x=h$ directrix $y=k-\frac{1}{4a}$ focus $(h, k+\frac{1}{4a})$
		$x=a(y-k)^2+h$	axis of symmetry $y=k$ directrix $x=h-\frac{1}{4a}$ focus $(h+\frac{1}{4a}, k)$
Ellipse		$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$	foci $(h \pm c, k)$, where $c^2=a^2-b^2$
		$\frac{(y-k)^2}{a^2}+\frac{(x-h)^2}{b^2}=1$	foci $(h, k \pm c)$, where $c^2=a^2-b^2$
Hyperbola		$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$	foci $(h \pm c, k)$, where $c^2=a^2+b^2$
		$\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$	foci $(h, k \pm c)$, where $c^2=a^2+b^2$