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Vertical Parabola

$x^2 = 4py$

Vertex: (0,0)

Focus: (0, p)

Directrix: $y = -p$

$p > 0$: *opens up*

$p < 0$: *opens down*

Focal diameter = $|4p|$

Vertical Ellipse

$\frac{x^2}{}$ $\frac{y^2}{}$

Horizontal Parabola

$y^2 = 4px$

Vertex: (0,0)

Focus: (p, 0)

Directrix: $x = -p$

$p > 0$: *opens right*

$p < 0$: *opens left*

Focal diameter = $|4p|$

Horizontal Ellipse

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1; a > b$

Sequences

Arithmetic Sequence	Geometric Sequence
n term th $an = a_1 + (n-1)d$	n term th $an = a_1 r^{n-1}$
Partial Sum $S_n = \frac{n(a_1 + a_n)}{2}$	Finite sum $S_n = \frac{a}{}(1 - r^n)$
Partial sum $S_n = \frac{[n(2a + (n-1)d)]}{2}$	Infinite sum $S = \frac{a}{1-r}; \lvert r \rvert < 1$

$\frac{}{a^2} + \frac{}{b^2} = 1; b > a$

Vertices: (0, ±a)

*Major axis: 2*b

*Minoraxis: 2*a

Focus: (0, ±*c*)

$c^2 = b^2 - a^2$

Vertical Hyperbola

$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$

Vertices: (0, ±*a*)

Transverse: 2*a*

Asymptotes: $y = \pm \frac{a}{b} x$

Fo cus: (0, ±*c*)

$c^2 = a^2 + b^2$

Vertices: (±a, 0)

Major axis: 2a

Minor axis: 2b

Focus: (±*c*, 0)

$c^2 = a^2 - b^2$

Horizontal Hyperbola

$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

Vertices: (±*a*, 0)

Transverse: 2*a*

Asymptotes: $y = \pm \frac{b}{a} x$

Fo cus: (±*c*, 0)

$c^2 = a^2 + b^2$

Radius: r, Center: (h, k)

Circle (ellipse a = b)

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

Rational Functions

$$f(x) = \frac{ax^n}{bx^m} + \cdots + \cdots$$

1. x –intercept: set top = 0.
2. y –intercept: let x = 0.
3. Vertical asymptotes of $f(x)$ are the zeros of the denominator.
4. if n < m, horizontal asymptote: y = 0.
5. if n = m, horizontal asymptote: y = a/b.
6. if n > m then no horizontal asymptote.
7. if n = m+1, find slant asymptotes by division.

Factorials- Coefficients

$$\binom{n}{r} = \frac{n!}{r!!}(n-r)$$

Exponential Growth & Decay

$M(t) = n_0 e^{rt}$; r negative for decay

$r = \frac{\ln 2}{h}$; h = half-life & doubling

Partial Fractions Decomposition

$$\frac{1}{(x-a)(x-b)} = \frac{A}{x-a} + \frac{B}{x-b};$$

$$\frac{1}{(x-a)^2(x-b)} = \frac{A}{x-a} + \frac{B}{(x-a)^2} + \frac{C}{x-b};$$

$$\frac{1}{(x^2+a)(x-b)} = \frac{Ax+B}{x^2+a} + \frac{C}{x-b}$$