Equations to remember

Equations not given in the formula sheet

- *Completing the square*:

$$x^2 + bx = \left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2$$

- *By completing the square for a quadratic equation, you can find its turning point*:

$$y = a(x + p)^2 + q$$
$$turning\ point = (-p, q)$$

- *Discriminants* $(for\ ax^2 + bx + c)$

$$b^2 - 4ac > 0 \quad : 2\ distinct\ real\ roots$$
$$b^2 - 4ac = 0 \quad : 1\ repeated\ root$$
$$b^2 - 4ac < 0 \quad : No\ real\ roots$$

- *Discriminants can be used to find number of intersection points between two graphs, equate* $f(x) = g(x)$ *and make it into* $ax^2 + bx + c$ *format and find discriminants*

- *Gradient of a straight line graph*

$$m = \frac{Rise}{Run} = \frac{y_b - y_a}{x_b - x_a}$$

- *Equation of a straight line graph*

$$y - y_1 = m(x - x_1)$$

- *When two straight line graphs are parallel*:

$$m_1 = m_2$$

- *When two straight line graphs are perpendicular*:

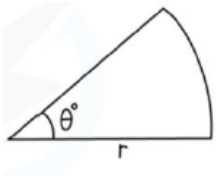
$$m_1 \times m_2 = -1$$

Radians

- $DEGREES \rightarrow RADIANS \ : Degrees\ value \times \frac{\pi}{180}$
- $RADIANS \rightarrow DEGREES \ : Radians\ value \times \frac{180}{\pi}$

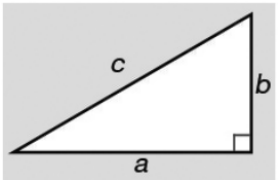
$$2\pi = 360$$
$$\pi = 180$$
$$\frac{\pi}{2} = 90$$

- $Arc\ Length = r\theta$
- $Area\ of\ sector = \frac{1}{2}r^2\theta$



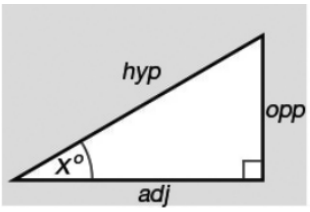
Geometry

- $Pythagoras\ Theorem: c^2 = b^2 + a^2$



- $SOH - CAH - TOA$:

$$sin\theta = \frac{Opposite}{Hypotenuse} \qquad cos\theta = \frac{Adjacent}{Hypotenuse} \qquad tan\theta = \frac{Opposite}{Adjacent}$$



- $Sine\ Rule$:

$$\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC} \qquad OR \qquad \frac{sinA}{a} = \frac{sinB}{b} = \frac{sinC}{c}$$

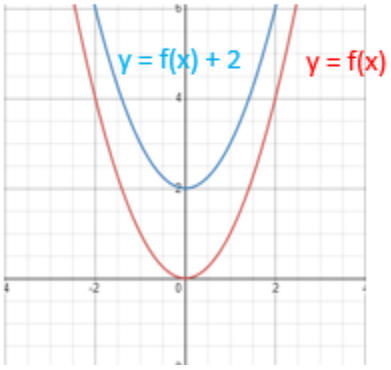
- $Area\ of\ a\ Triangle\ Rule$:

$$Area = \frac{1}{2}ab\ sinC$$

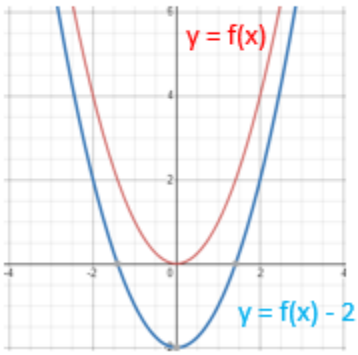
Translating Graphs

$$y = f(x) + a$$

$+a$: *upward movement*

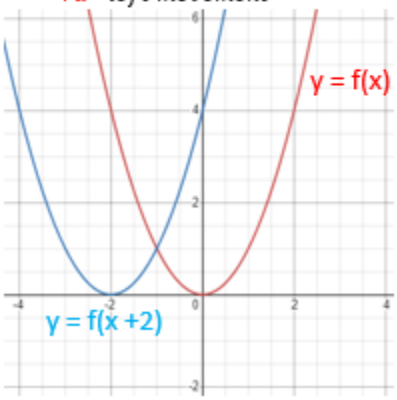


$-a$: *downward movement*

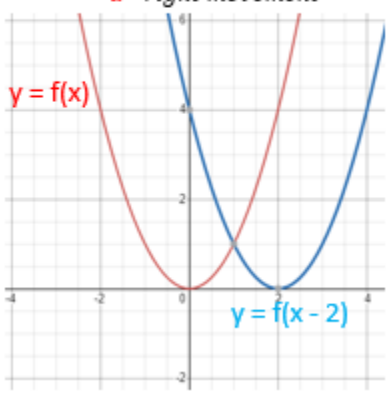


$$y = f(x + a)$$

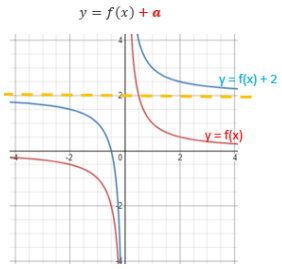
$+a$: *left movement*

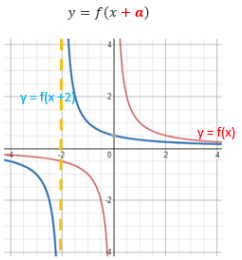


$-a$: *right movement*



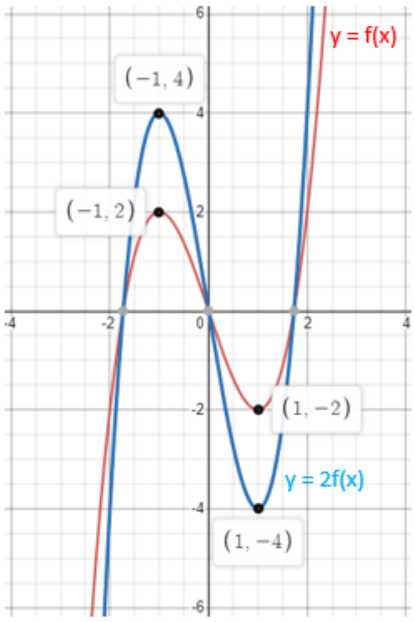
*REMEMBER for reciprocal graphs, the asymptotes move:





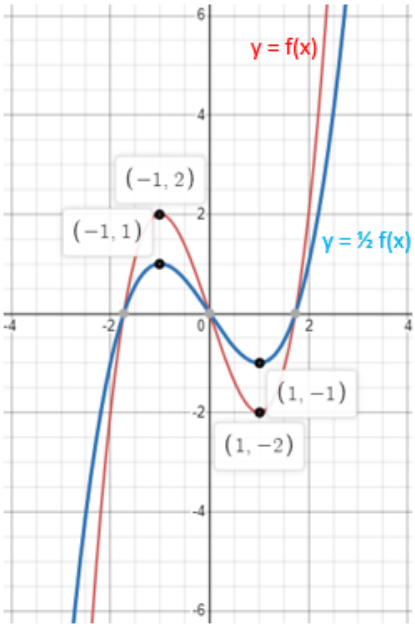
$$y = af(x)$$

$a > 1$: *Stretch outwards*



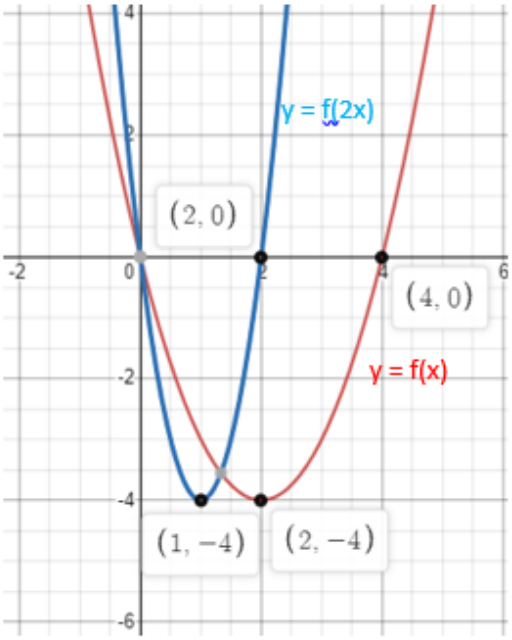
$a < 1$: *shrink inwards*

Eg: ½ f(x)



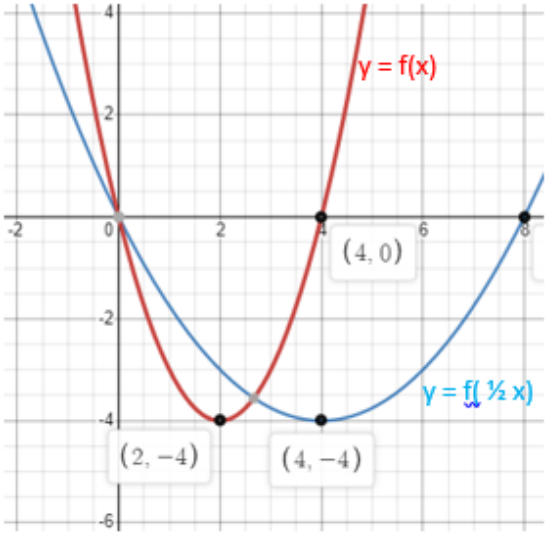
$$y = f(ax)$$

$a > 1$: *Shrink inwards*



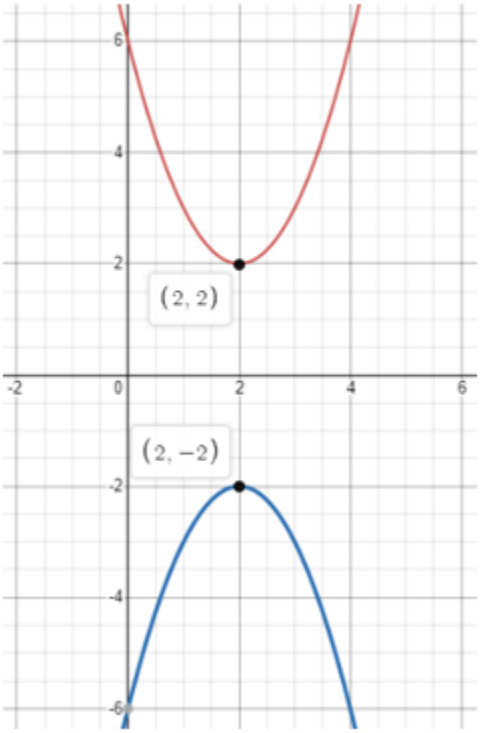
$a < 1$: *Stretch sideways*

Eg: f(½x)



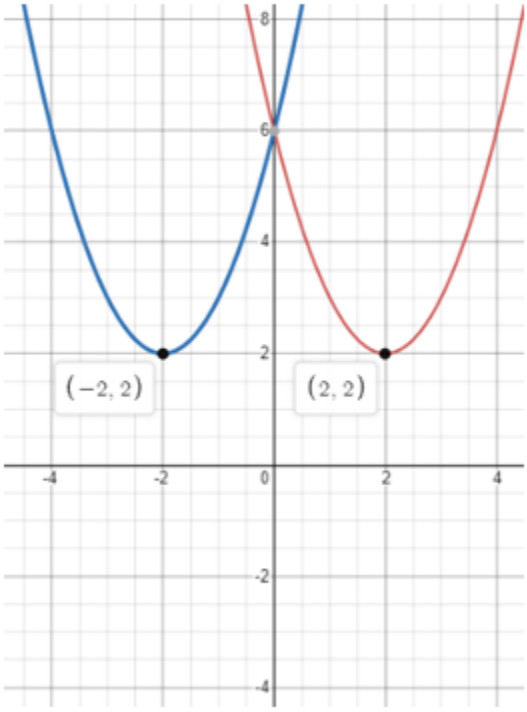
$y = -f(x)$

is the reflection at the $x-$ *axis*



$y = f(-x)$

is the reflection at the $y-$ *axis*



Trigonometric Graphs