HIGH SCHOOL MATHEMATICS

SKETCHING CURVES & TRANSFORMATIONS

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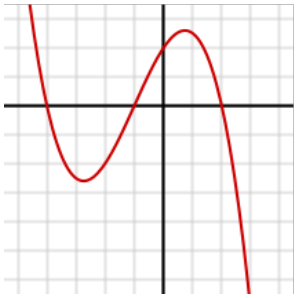
Cubic Functions:

Any function that is in the form of $f(x) = ax^3 + bx^2 + cx + d$

Sketching quadratic curves: $f(x) = ax^3 + bx^2 + cx + d$

$a > 0$

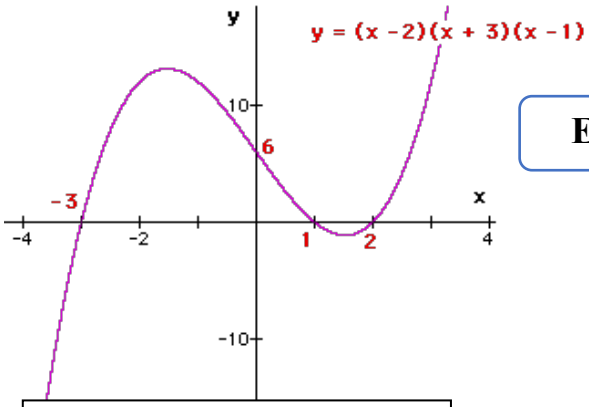
$a < 0$



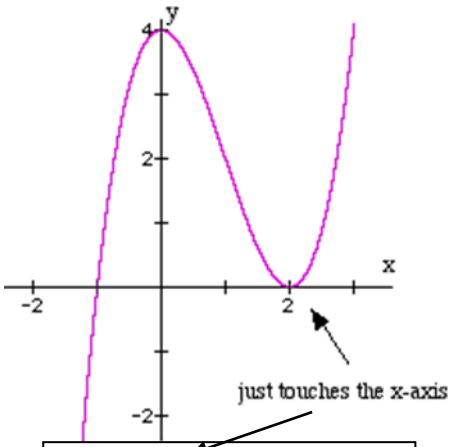
Steps to follow:

- *Draw the curve by considering the sign of a,*
- *Draw the x-axis by considering the number of roots,*
- *When we have double roots the curve should touch the x-axis and bounce back, when it's single root then it should cross the x-axis.*
- *Draw y-axis (vertical line at x=0)*
- *Evaluate the value of y by substituting x=0 in the function and label.*

Examples

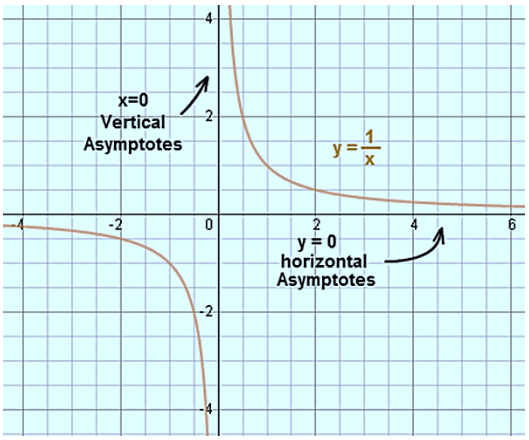


$y = (x - 2)(x + 3)(x - 1)$

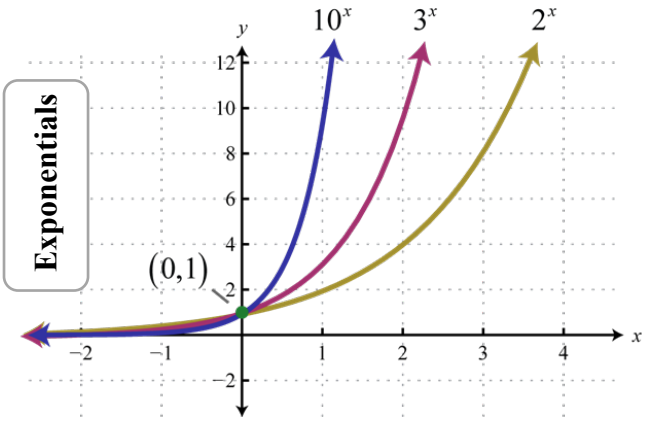


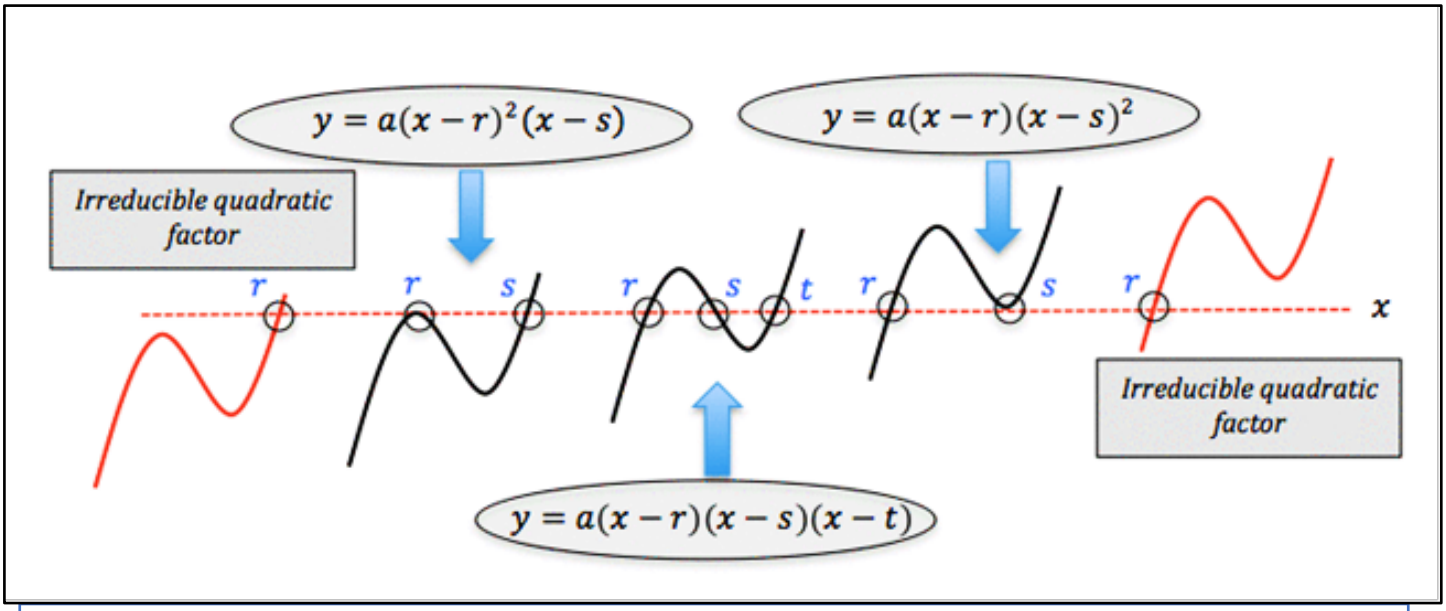
$y = (x - 2)^2(x + 1)$

Reciprocals



Exponentials





Transformations:

Original function is $y = f(x)$, a is positive constant ;		
	Transformation	***What should I do?***
$y = f(x) + a$	***Vertical translation***	***Move the graph a unit up***
$y = f(x) - a$	***Vertical translation***	***Move the graph a unit down***
$y = f(x - a)$	***Horizontal translation***	***Move the graph a unit right***
$y = f(x + a)$	***Horizontal translation***	***Move the graph a unit left***
$y = -f(x)$	***Reflection in x-axis***	***Reflect in x-axis***
$y = f(-x)$	***Reflection in y-axis***	***Reflect in y-axis***
Original function is $y = f(x)$, a is positive constant , $a > 1$;		
$y = af(x)$	***Vertical Stretch***	***Multiply y-values (only) by a***
$y = \frac{1}{a}f(x)$	***Vertical Compression***	***Divide y-values (only) by a***
$y = f(ax)$	***Horizontal Compression***	***Divide x-values (only) by a***
$y = f\left(\frac{1}{a}x\right)$	***Horizontal Stretch***	***Multiply x-values (only) by a***
$y = f^{-1}(x)$	***Inverse of a function***	***Reflect in the line y=x (Swap x and y values)*** $(x, y) \rightarrow (y, x)$