Math 112

$\boxed{\text{Q's}}$ $\dfrac{\boxed{f(x+h)} - f(x)}{h}$ for $f(x) = \sqrt{x+a}$

$f(\square) = \sqrt{\square + a}$

$$\frac{\sqrt{(x+h)+a} - \sqrt{x+a}}{h} = \frac{\sqrt{x+h+a} - \sqrt{x+a}}{h}$$

Fact: $(\underline{a}+\underline{b})(\underline{a}-\underline{b}) = \underline{a}^2 - \underline{b}^2$

$$\frac{\left(\sqrt{x+h+a} - \sqrt{x+a}\right)}{h} \frac{\left(\sqrt{x+h+a} + \sqrt{x+a}\right)}{\left(\sqrt{x+h+a} + \sqrt{x+a}\right)} = \frac{(\cancel{x}+h+\cancel{a}) - (\cancel{x}+\cancel{a})}{h\left(\sqrt{x+h+a} + \sqrt{x+a}\right)}$$

So $\rightarrow$ $\dfrac{\cancel{h}}{\cancel{h}\left[\sqrt{x+h+a}+\sqrt{x+a}\right]} = \boxed{\dfrac{1}{\sqrt{x+h+a}+\sqrt{x+a}}}$

$$\frac{1}{(1+\sqrt{2})}\frac{(1-\sqrt{2})}{(1-\sqrt{2})} = \frac{1-\sqrt{2}}{1-2} = \boxed{\sqrt{2}-1}$$

$$\frac{1-\sqrt{2}}{-1} = \sqrt{2}-1$$

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$f(4) = -5$ $g(4) = 1$
$f(5) = 0$ $g(5) = 5$

x	$f(x)$	$g(x)$
4	-5	1
5	0	5
6	0	-5
7	-3	-4
8	3	2

Use the table defining f and g to solve:
NOTE: Write *Does not exist* if the value does not exist.

a) $(f-g)(4) =$

b) $(f+g)(4)-(g-f)(5) =$

c) $\left(\frac{f}{g}\right)(4) =$

(b) $\overset{-4}{\boxed{(f+g)(4)}} - \overset{5}{\boxed{(g-f)(5)}}$

$f(4)+g(4)$ $\qquad$ $g(5)-f(5)$

$-5+1$ $\qquad$ $5-0$

$(-4)-(5)$

$=-9$

☐ Let $f(x) = \boxed{\dfrac{x}{x^5-x^3+9}}$. $\rightarrow f(\square) = \dfrac{\square}{\square^5-\square^3+9}$

Determine $f(-x)$ first and then determine whether the function is even, odd, or neither. Write **even** if the function is even, **odd** if the function is odd, and **neither** if the function is neither even nor odd.

$f(-x) =$

Even/Odd/Neither:

① even means sym about y-axis

② odd means sym about origin

$$f(-x) = \frac{-x}{(-x)^5-(-x)^3+9} = \boxed{\frac{-x}{-x^5+x^3+9}}$$

$f(x) = x^4 + 2x^2 + 1$

$f(-x) = (-x)^4 + 2(-x)^2 + 1$

$= x^4 + 2x^2 + 1$

sym about y-axis

$\boxed{\text{even}}$

$f(x) = x^3 - x$

$f(-x) = (-x)^3 - (-x)$

$= -x^3 + x$

$= -(x^3 - x)$

sym. about origin

$\boxed{\text{odd}}$

2.3 Quadratics (is a polynomial)

general polynomial

domain $(-\infty, \infty)$

$f(x) = a_n x^n + \cdots + a_3x^3 + \underbrace{a_2x^2 + a_1x + a_0}_{}$

(n) degree

lead coeff

quadratic

Quadratics

$f(x) = ax^2 + bx + c$ (but $a \neq 0$)

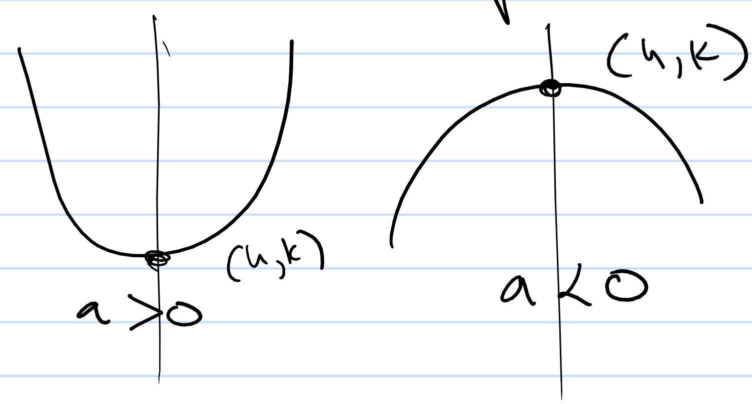
domain $(-\infty, \infty)$

general form of a quadratic

Graph of a quadratic is called parabola

$y = ax^2 + bx + c$

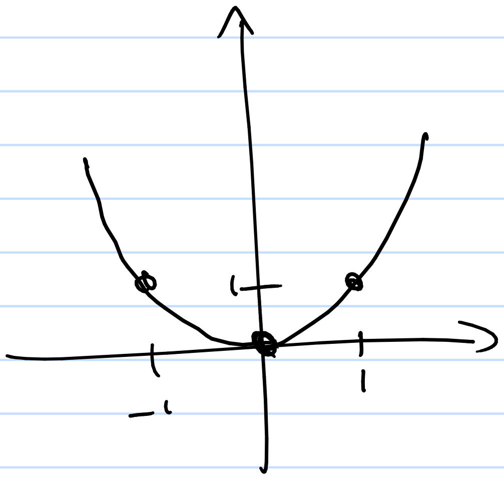
Vertex is (h, k)



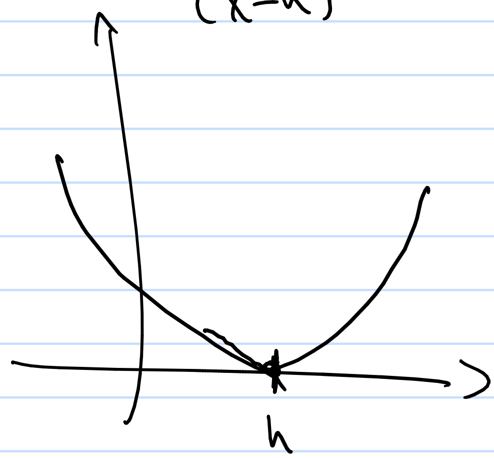
$f(x) = a(x-h)^2 + K$ vertex is (h,k)

is the standard form or vertex form

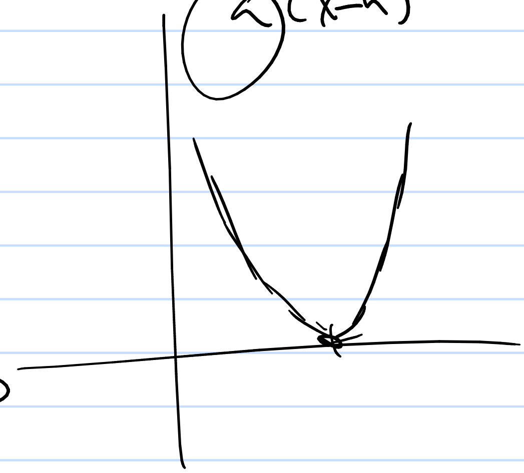
$f(x) = x^2$



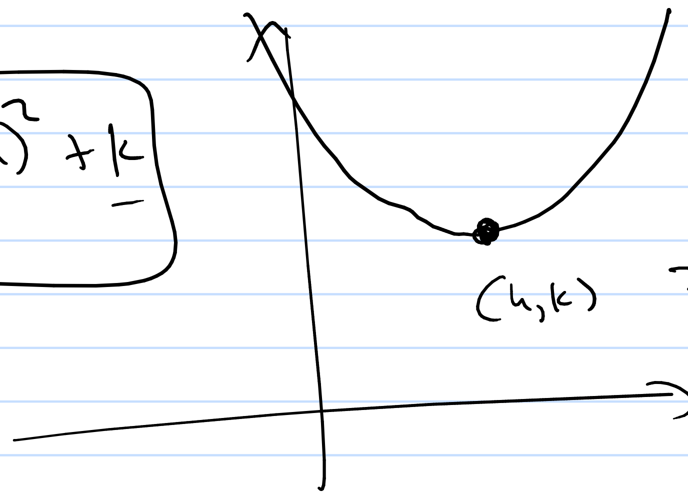
$(x-h)^2$



$a(x-h)^2$



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



$\to \frac{3}{36} = \frac{1}{12} \quad -\frac{1}{6} \quad -2$

x	y
-1	0
2/3	0
0	-2
-1/6	-25/12

graph? ex $y = 3x^2 + x - 2$

table of values! x or y intercepts

(1) y-intercept $x = 0$ $y = -2$

(2) x-intercepts $0 = \boxed{3x^2 + x - 2}$

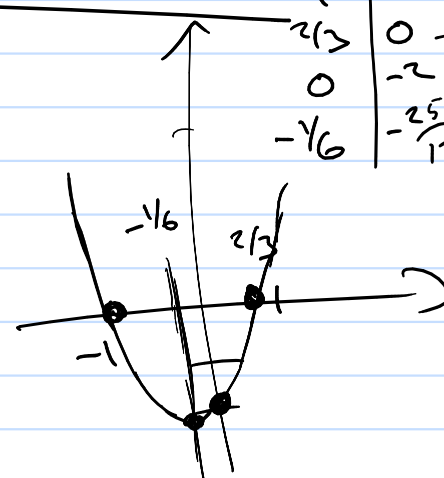
$0 = (3x-2)(x+1)$

$x = 2/3$ $x = -1$

$3x - 2 = 0$

$3x = 2$

$x = 2/3$



Quadric formula

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

$$\boxed{x^2 + \frac{b}{a}x} + \frac{c}{a} = 0$$

$d^2 - e^2 = (d+e)(d-e)$ ← difference of Squares

☆ $d^2 + 2de + e^2 = (d+e)^2$ ← perfect square trinomial

$$\boxed{x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2} - \left(\frac{b}{2a}\right)^2 + \frac{c}{a} = 0$$

$$\left[\left(x + \frac{b}{2a}\right)^2\right] - \left[\left(\frac{b}{2a}\right)^2 - \frac{c}{a}\right] = 0$$

$$\left[\left(x + \frac{b}{2a}\right)^2\right] - \left[\sqrt{\frac{b^2 - 4ac}{4a^2}}\right]^2 = 0$$

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

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