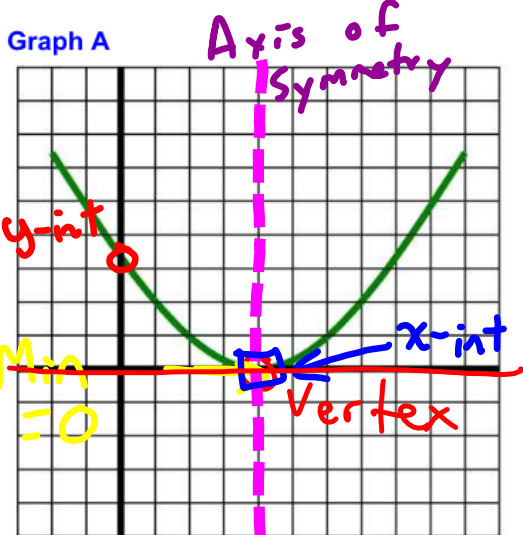## 5.3.2: Key Features of Quadratic Relations

Terminology	Definition	How Do I Label It?	Graph A	Graph B
Vertex	The maximum or minimum point on the graph. It is the point where the graph changes direction.	(x,y)	$(4,0)$	$(3.5,6)$
Minimum/ maximum value	y-value of vertex Max ⌢ Min ⌣	Min = Max =	Min = 0	Max = 6
Axis of symmetry	Vertical line that cuts a parabola into 2 equal halves.	$x=$	$x=4$	$x=3.5$
y-intercept	crosses the y-axis	y-int =	y-int = 3.5	y-int = 2
x-intercepts	Crosses the x-axis	x-int =	x-int = 4	x-int = -1 and = 8
Zeros	x-ints			

Label the graphs using the correct terminology.

Graph A

Axis of Symmetry

y-int

Min = 0

x-int

Vertex

Graph B

A.o.S

Vertex   Max = 6

y-int

x-int x-int

$$y = x^2 + \ldots$$

2 x-int

1 x-int

0 x-ints
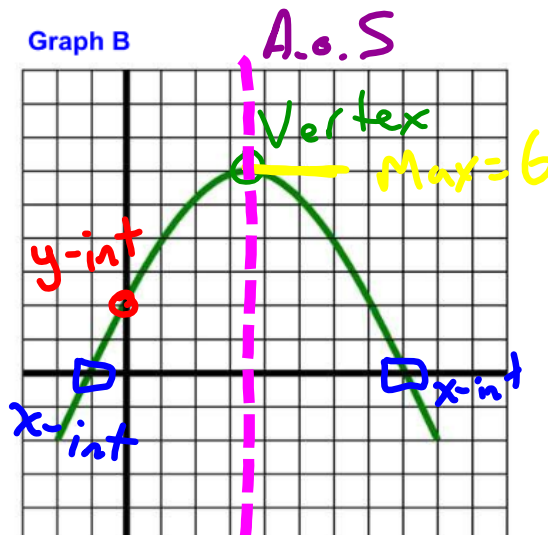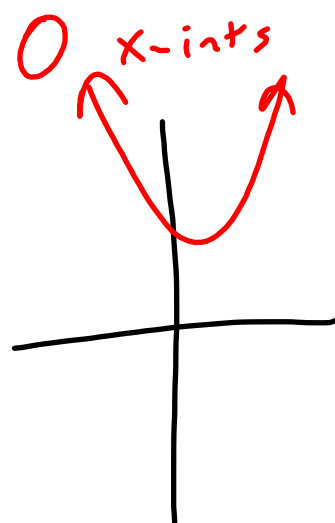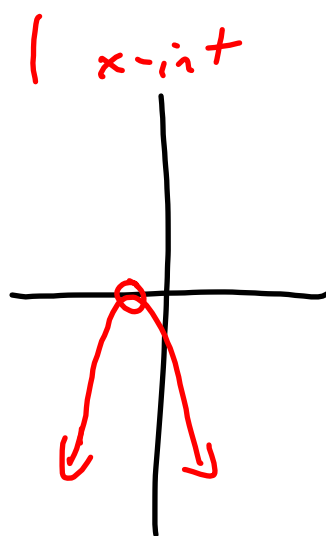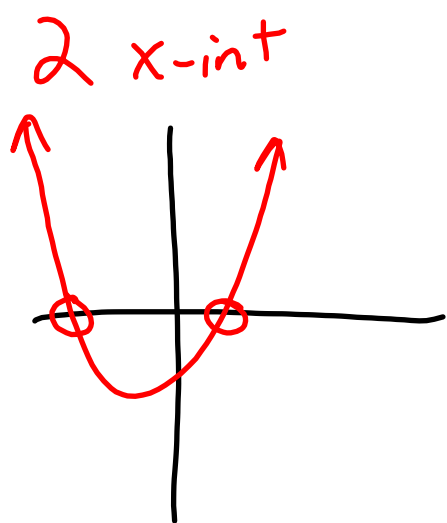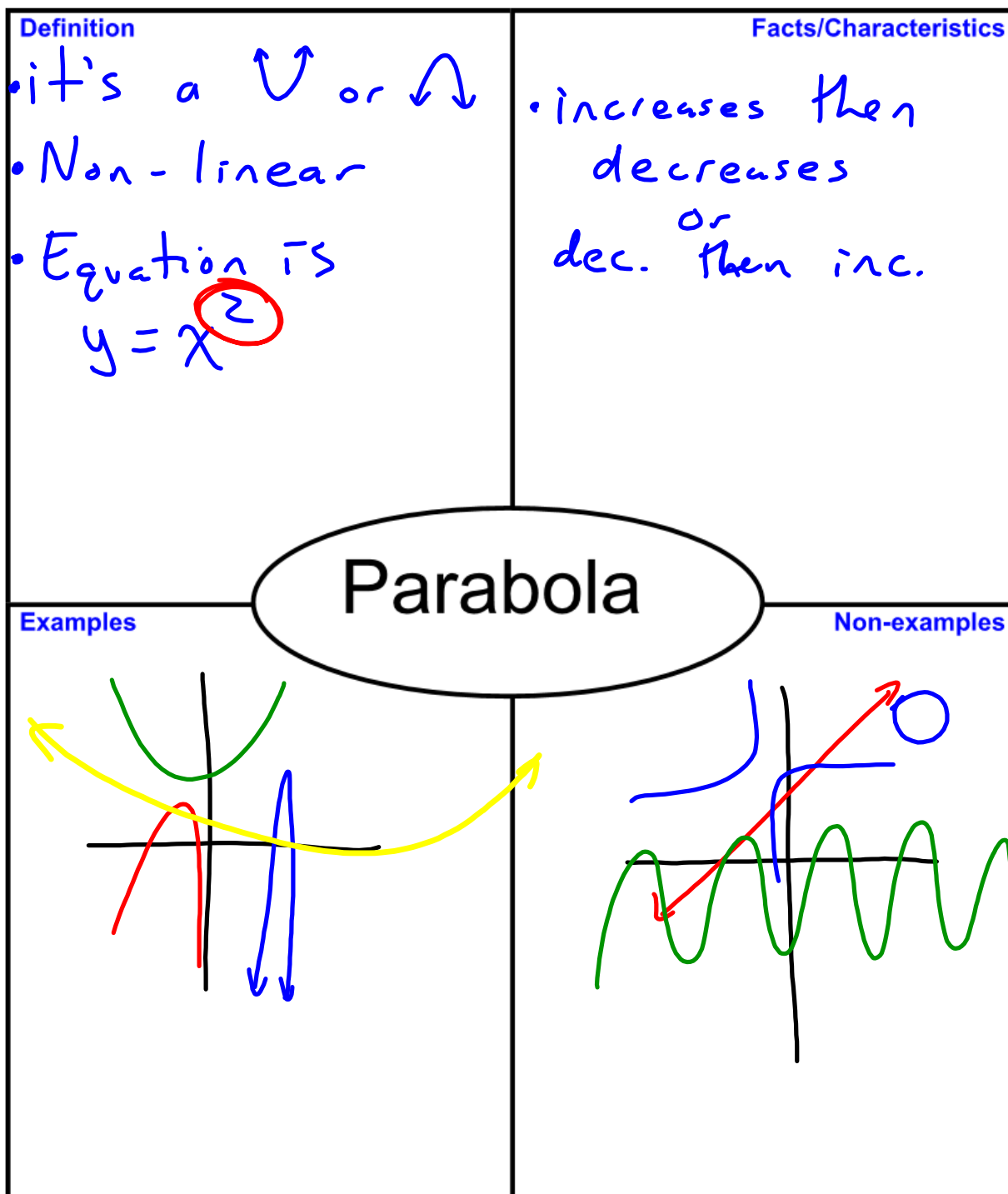
5.4.1: Key Features of a Parabola

Write the feature of a parabola that you were given in the centre of the graphic. Complete the chart. Include sketches and graphs with your work.

Definition	Facts/Characteristics
• it's a $\cup$ or $\cap$ • Non-linear • Equation is $y = x^{2}$	• increases then decreases or dec. then inc.

<div align="center">

Parabola

</div>

Examples	Non-examples

Exponent Rules - Review

Match

$a^4 \cdot a^4$ a^{16}

$\dfrac{a^{20}}{a^4}$ a^6

$(a^3)^2$ a^8

$$\left(a^4\right)\cdot\left(a^4\right)$$

$$=\left(a\cdot a\cdot a\cdot a\right)\cdot\left(a\cdot a\cdot a\cdot a\right)$$

$$=a^8$$
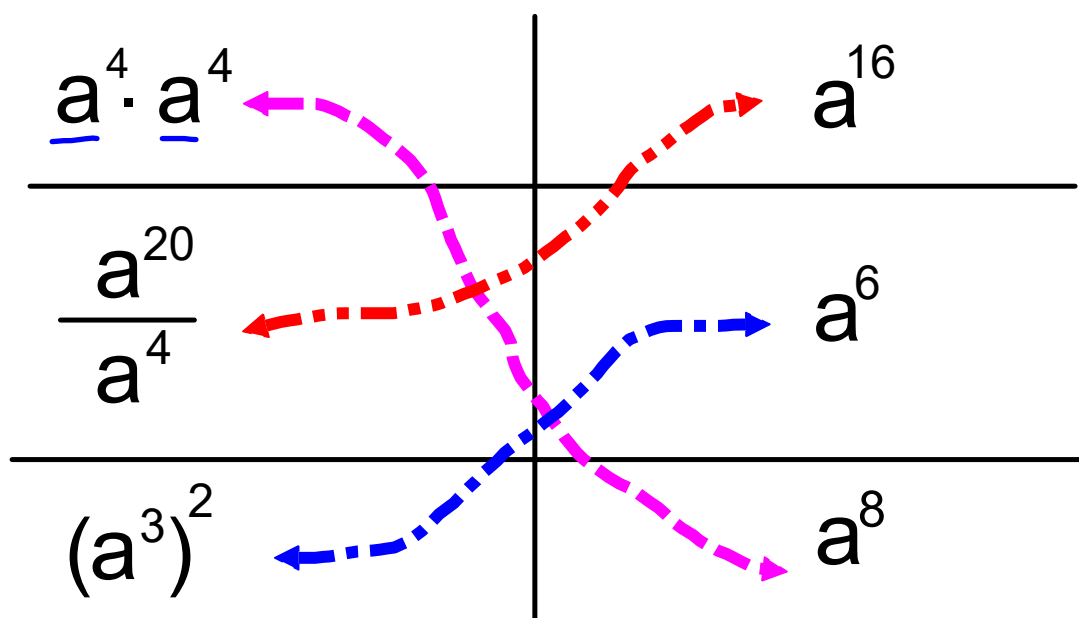
$$\frac{x^7}{x^4} = x^3$$

$$= \frac{\cancel{x}\,\cancel{x}\,\cancel{x}\,\cancel{x}\,x\,x\,x}{\cancel{x}\,\cancel{x}\,\cancel{x}\,\cancel{x}}$$

1. $a^m \cdot a^n = a^{m+n}$,

2. $\dfrac{a^m}{a^n} = a^{m-n}$, $(a \neq 0)$,

3. $(ab)^m = a^m b^m$,

4. $\left(\dfrac{a}{b}\right)^m = \dfrac{a^m}{b^m}$, $(b \neq 0)$,

5. $(a^m)^n = a^{mn}$.

Simplify   Expand and simplify

$$\frac{x^3}{x^6} = x^{3-6}$$

$$= x^{-3}$$

$$\frac{x^3}{x^6} = \frac{x \cdot x \cdot x}{x \cdot x \cdot x \cdot x \cdot x \cdot x} = \frac{1}{x \cdot x \cdot x \cdot x}$$

$$= \frac{1}{x \cdot x \cdot x}$$

$$= \frac{1}{x^3}$$

Therefore

This is true for ALL negative exponents

$$x^{-y} = \frac{1}{x^y} \quad \text{AND} \quad x^{-3} = \frac{1}{a^3}$$

$$\left(\frac{a}{b}\right)^{-x} = \left(\frac{b}{a}\right)^{x}$$

Simplify　　　　　　　　　　Expand and simplify

$$\frac{x^6}{x^6} = x^{6-6}$$

$$= x^0$$

$$\frac{x^6}{x^6} = \frac{\cancel{x}\,\cancel{x}\,\cancel{x}\,\cancel{x}\,\cancel{x}\,\cancel{x}}{\cancel{x}\,\cancel{x}\,\cancel{x}\,\cancel{x}\,\cancel{x}\,\cancel{x}}$$

$$= 1$$

Therefore

$$x^0 = 1$$

Is this true for ALL terms that have a zero exponent?

Yes, any term to the power zero equals 1

ex.　$$(235.892x^4 y^7 z^{-3} 🐸)^0$$

$$= 1$$

Examples <u>Simplify</u>

$$\left(2x^2 y\right)^{③}$$

$$= 2^3 x^{2 \cdot 3} y^3$$

$$= 8 x^6 y^3$$

$$\left(\frac{x^7}{x^{11}}\right)^2$$

$$= \left(x^{-4}\right)^2$$

$$= x^{-8}$$

$$= \left(\frac{1}{x}\right)^8 \quad \text{OR} \quad \frac{1}{x^8}$$

$$\left(\frac{317}{142} x^{17} y^{-21} \; \text{PCFD} \right)^0$$

$$= 1$$