

INVESTIGATION 1

Graphing $y = ax^2$, when 'a' is positive

Complete each table of values. Use a different colour to sketch a graph of each parabola on the axes above.0.5

$y = (\frac{1}{2})x^2 = 0.5x^2$			$y = \frac{1}{4}x^2 = 0.25$				$y = 2x^2$	$y = 3x^2$			
x	(x , y)		x	(x , y)		x	(x , y)	x	(x , y)		
-4	0.5(-4) ² = 8		-4	0.25 (-4) ² = 4		-4	2(-4) ² = 32	-4	3(-4) = 48		
-3	0.5(-3)2= 4.5		-3	0.25(-3)2= 225		-3	2(-3) ² = 18	-3	3(-3)= 27		
-2	0.7(-2) ² =2		-2	0.75(-2)=1		-2	2(-2)2=8	-2	3(-2)= 12		
-1	0.5(-1)2= 0.5		-1	0.25 (-1) ² = 0.25	-	-1	$2(-1)^2 = 2$	-1	$3(-1)^2 = 3$		
0	0.5(0)=0		0	$0.25(0)^2 = 0$		0	2(0)2=0	0	3(0) ² = 0		
1	0.5(1)2=0.5		1	0.25(1)2= 0.25		1	2(1) ² = 2	1	3(1) ² = 3		
2	0.5(2) ² =2		2	$0.25(2)^2 = 1$		2	$2(2)^{2} = 8$	2	3(2)2= 12		
3	$0.5(3)^2 = 4.5$		3	0.25 (3)2= 2.25		3	2(3) ² = 18	3	3(3)= 27		
4	$0.5(4)^2 = 8$		4	0.25(4) ² = 4		4	2(4) ² = 32	4	8(4) ² = 48		
		-		· · · ·		1.13	P .				

When 'a' is positive and |a| < 1, the parabola opens <u>up</u> and is <u>vertically</u> Compressed When 'a is positive and |a| > 1, the parabola opens <u>up</u> and is <u>vertically stretched</u> This type of transformation is called a Vertical compression/stretch

INVESTIGATION 2

Graph	:		-	-	;	† γ					_				
Compl	ete the table of values	for parabola $y = -x^2$.	- 4 		-2/	1			2	 	4		
x	$y = -x^2$	(x,y)			/		1	1							
-4	- (-4) ² = -16	(-4,-16)			/		4	/		\overline{H}					
-3	- (-3) ² = -9	(-3, -9)		/	//		(1]				 				
-2	$-(-2)^2 = -4$	(-2,-4)	V	<u>† </u>		4	///			}	 {-				S)
-1	-(-1) ² =-1	(-1,-1)	Ϊ	/		71	1				1-1				Ŭ
0	$(0)^{2} = 0$	(0,0)				4		-10			 	<u>}</u>		V	
1	$-(1)^{2}=-1$	(1,-1)		¦					<u> </u>		$\left \right $	<u>}</u>			
2	$(2)^{2} = -4$	(2,-4)				k			-		$\left \right $	<u>_</u>			
3	$-(3)^{2}=-9$	(3,-9)		 		[]	\mathbf{b}	-¦				[}			
4	- (4) ² =-16	(4,-16)			<u> </u>)				V				
				:	С							<u></u>	3 !		

Complete each table of values. Use a different colour to sketch a graph of each parabold on the axes above.

	20.5		-0.1×2				\frown	
	$y = -\frac{1}{3}x^2$	\bigcirc	$y = -\frac{1}{5}x^2$	3	$y = -\frac{3}{2}x^2$	(4) 3	$y = -2x^2$
х	(x , y)	x	(x , y)	х	(x , y)		x	(x , y)
-4	$=\frac{-1}{3}(-4)^{L}=-16/3$	-4	=-0.2(-4) ² =-3.2	-4	=-1.5(-4)2= -24		-4	-2(-4)2=-32
-3	$=\frac{-1}{3}(-3)^2=-3$	-3	=-0.2 (-3) ² = -1.8	-3	$= -(.\tau(-3)^2 = -13.5)$		-3	-2(-3) ² = -18
-2	$=\frac{1}{3}(-2)^{2}=\frac{4}{3}$	-2		-2	= -15(-2)2=-6		-2	$-2(-2)^2 = -8$
-1	$=-\frac{1}{3}(-1)^2=-\frac{1}{3}$	-1		-1	=-1.5(-1)=-1.5		-1	$-2(-1)^2 = -2$
0	= 0	0	= 0	0	:0		0	0
1	$=\frac{-1}{3}(1)^2 = \frac{-1}{3}$	1	$=-0.2(1)^2 = -0.2$	1	=-1.T(1)2=-1.5		1	·2(J) ² =-2
2	$=\frac{-1}{3}(2)^{2}=-\frac{4}{3}$	2	= -0.2(2) ² =-0.8	2	=-1.5(2)=-6		2	-2(2) ² =-8
3	$=\frac{-1}{3}(3)^2=-3$	3	= -0.2(3) ² = -1.8	3	=-1.5(3)2-135		3	-2(3) ² =-18
4	$=-\frac{1}{3}(4)^2 = -\frac{16}{3}$	4	= -0.2(4) ² = -3.2	4	=-1.5(4)=-24		4	-2(4)2=-32
			· ·		· ·			

When 'a' is negative and |a| < 1, the parabola opens <u>lown</u> and is <u>compressed</u> When 'a' is negative and |a| > 1, the parabola opens <u>down</u> and is <u>stretched</u> When 'a' is negative, this type of transformation is called a reflection in the x-axis (oflip)

14

12

10

8

-2

2

Quadratic $y = ax^2$ Practice

1. In each picture, the graph of $y = x^2$ is shown as a dotted parabola (standard position). The solid parabola is the graph of a quadratic relation of the form $y = ax^2$. For each solid parabola, is the value of a :

- less than -1
- between -1 and 0
- between 0 and 1
- greater than 1?

Explain your answer.



2. On the same axis graph the following functions:

$y = 2x^2$
$2(-2)^2 = 8$
2(-1) ² =2
0
$2(1)^{2} = 2$
2(2) ² =8

(<u>v</u>)	$y = 3x^2$
-2	$3(-2)^2 = 12$
-1	$3(-1)^2 = 3$
0	0
1	$3(1)^2 = 3$
2	$3(2)^2 = R$

How are the graphs the same? Open up/porabola, stretched

How are the graphs different? 2

stretched more than (1) (norrower,

Does this function have a minimum or a maximum?

mia

-4

-2

stretched narrowe and it looks ____ If a > 1, the graph is vertically (stretched / compressed) (narrower / wider)

x

4

Date: Unit 4: Quadratics I