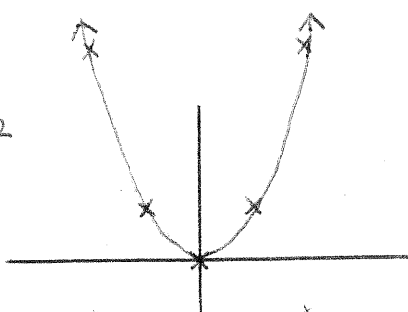


Achievement Standard 2.2

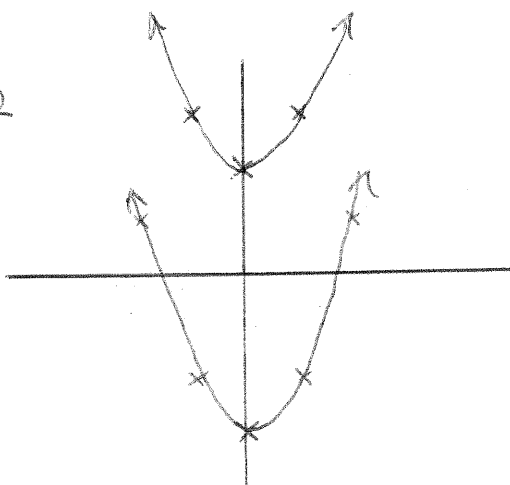
Graphing

Parabolas

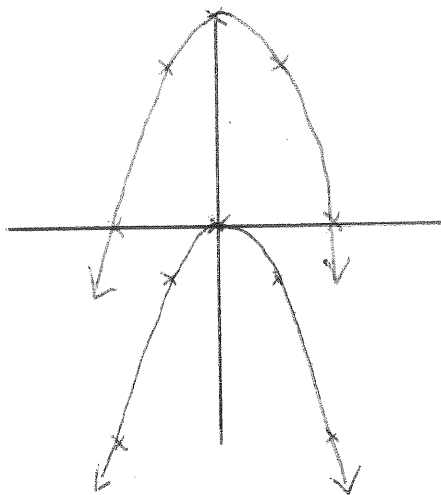
1) Graph $y = x^2$



2) $y = x^2 + 2$
 $y = x^2 - 3$

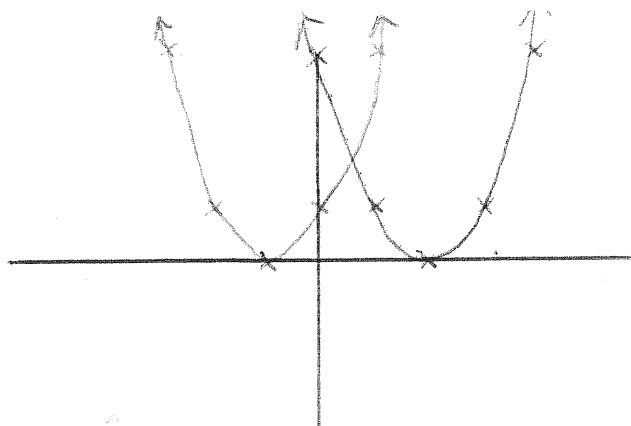


3) $y = -x^2$ •
 $y = 4 - x^2$ •

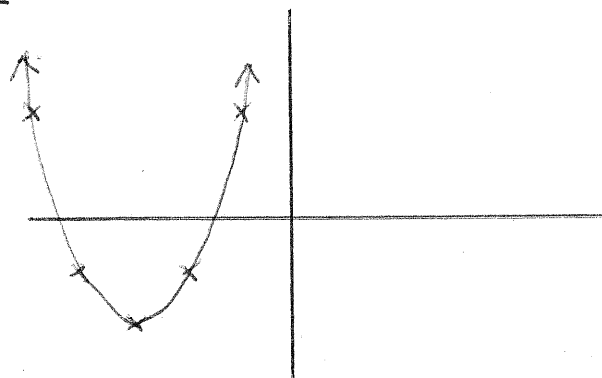


$$4) y = (x-2)^2$$

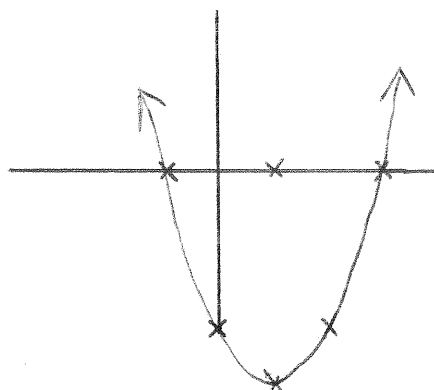
$$y = (x+1)^2$$



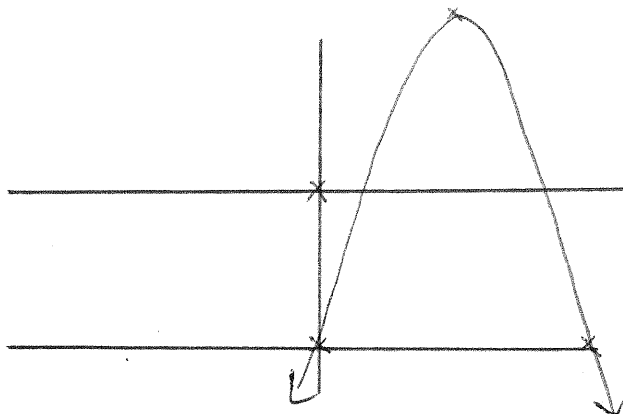
$$5) y = (x+3)^2 - 2$$



$$6) y = (x+1)(x-3)$$

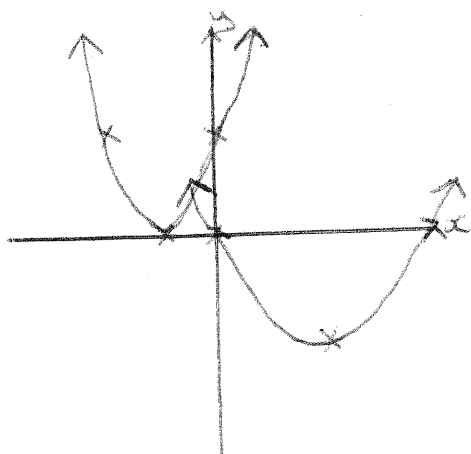


$$7) y = x(5-x)$$

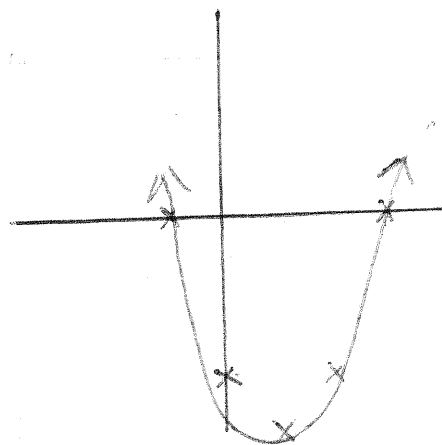


8) Graph $y = 2(x+1)^2$

$$y = \frac{1}{2}x(x-4)$$



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

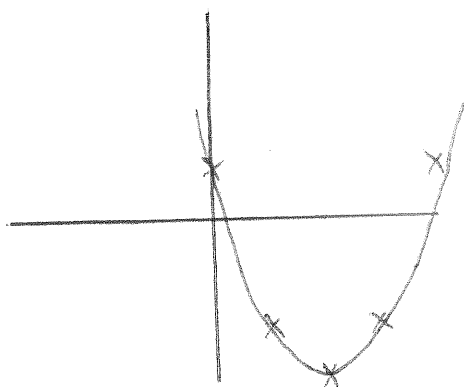


10) $y = x^2 - 4x + 1$

Does not factorise
 Complete the square

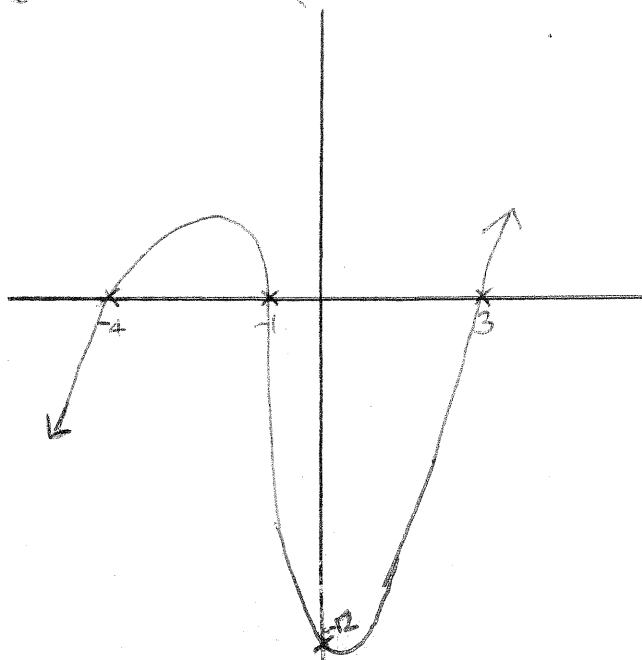
$$y = x^2 - 4x + 1$$

$$y = (x-2)^2 - 3$$

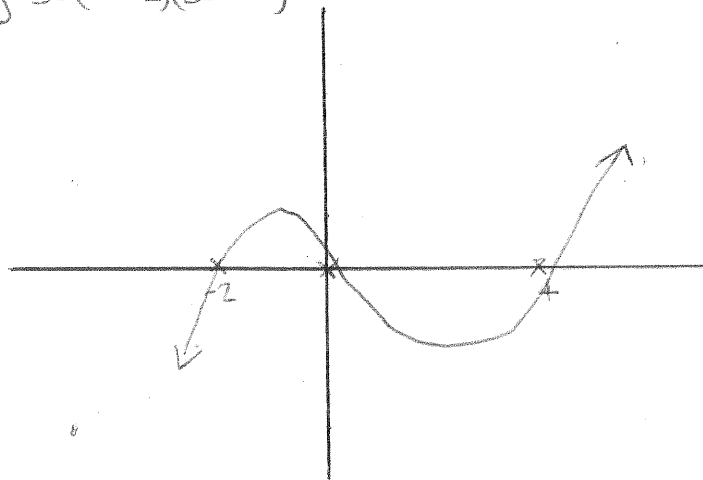


Cubics

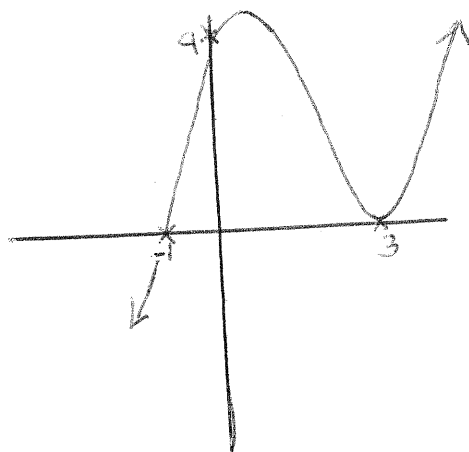
1) Graph $y = (x+1)(x-3)(x+4)$



2) Graph $y = x(x+2)(x-4)$



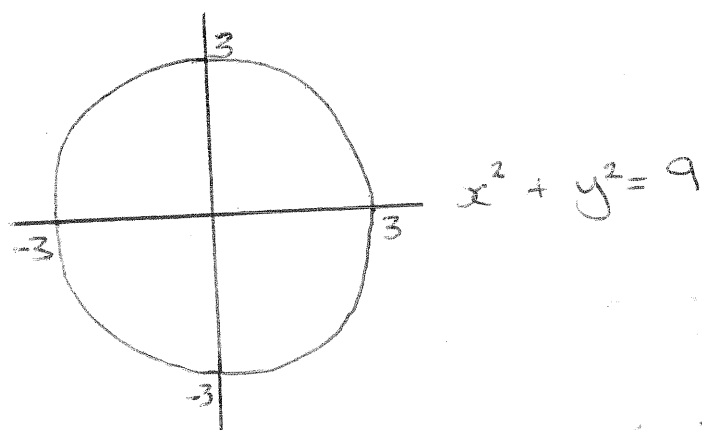
3) Graph $y = (x+1)(x-3)^2$



Circles

The equation of a circle, centre at $(0,0)$, and radius r , is $x^2 + y^2 = r^2$

eg



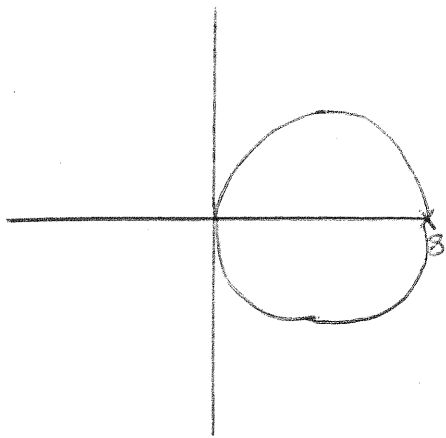
The equation of a circle, centre (a,b) , and radius r , is given by

$$(x-a)^2 + (y-b)^2 = r^2$$

e.g. $(x-2)^2 + (y+5)^2 = 100$

is a circle, centre $(2,-5)$, radius 10

2)



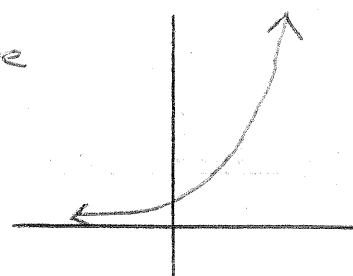
The equation of the circle drawn is

$$(x-4)^2 + y^2 = 16$$

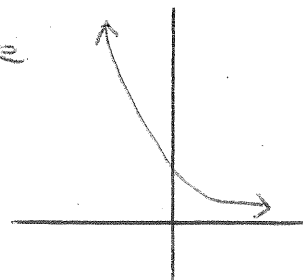
Exponential Curves

The equation of an exponential curve is $y = ka^x$

If $a > 1$, the curve is an exponential growth curve



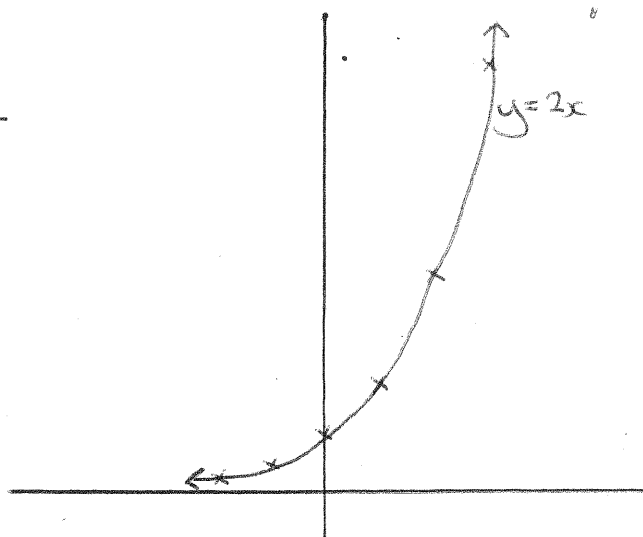
If $a < 1$, the curve is an exponential decay curve



Examples

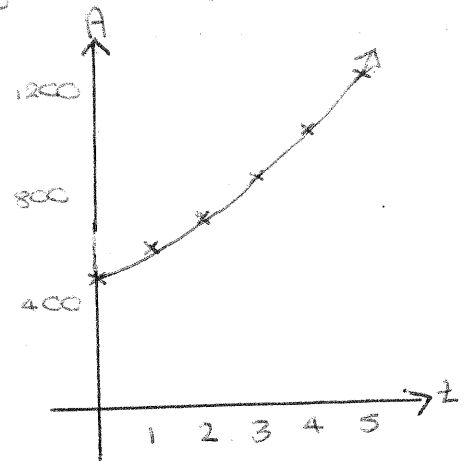
1) $y = 2^x$

x	-2	-1	0	1	2	3
y	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8



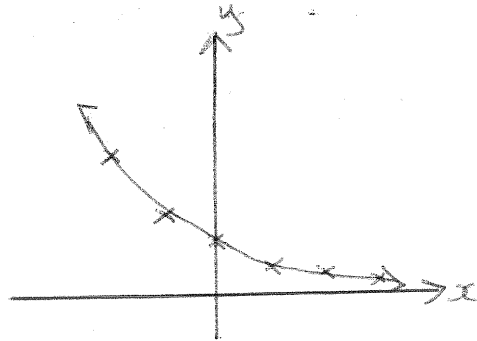
- 2) William invests \$500 at 20% compound interest paid once annually.
The amount A after t years is given by $A = 500 \times 1.20^t$

t	0	1	2	3	4	5
A	500	600	720	864	1037	1244



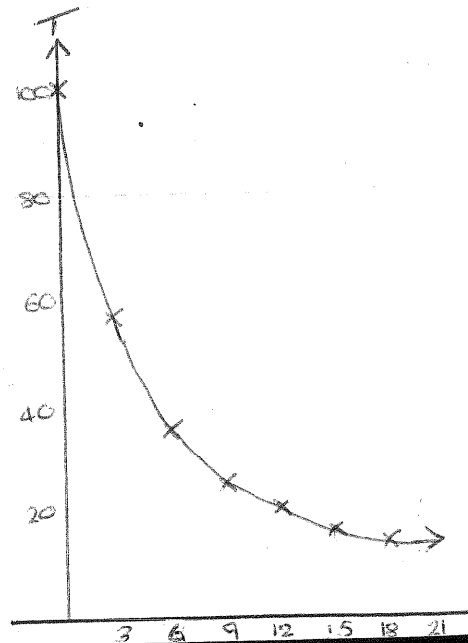
- 3) Graph $y = 0.6^x$

x	-2	-1	0	1	2	3
y	2.8	1.7	1	.6	.4	.2



- 4) An electric jug turns itself off
The water temperature T after t minutes is given by $T = 86 \times 0.8^t + 14$

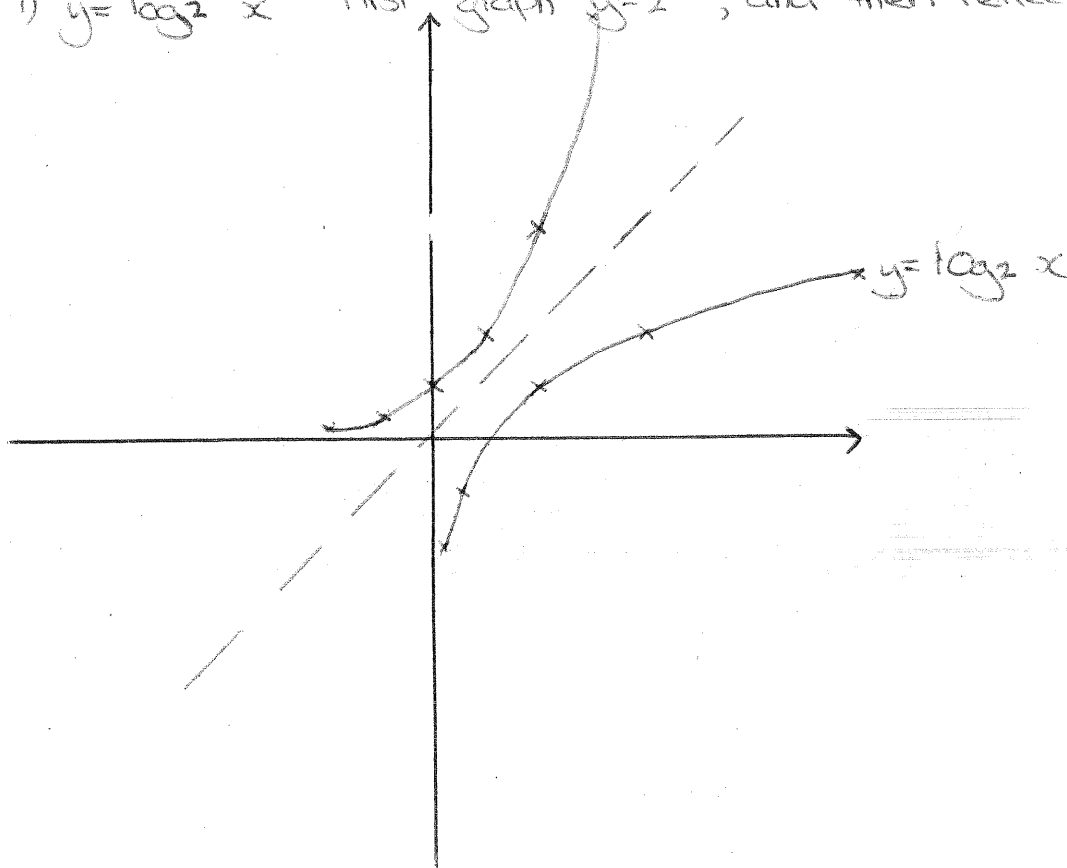
t	0	3	6	9	12	15	18
T	100	58	37	26	20	17	16



Logarithmic Graphs

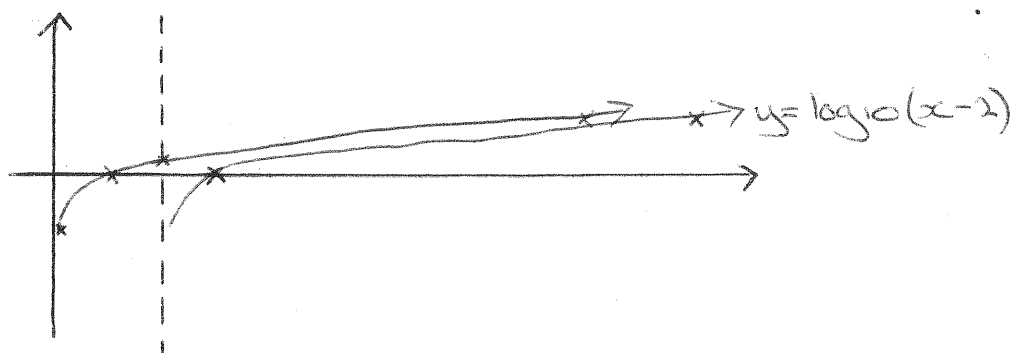
The graph of $y = \log_a x$ is the reflection of the exponential graph $y = a^x$ in the mirror line $y = x$.

1) $y = \log_2 x$ First graph $y = 2^x$, and then reflect in line $y = x$



2) Graph $y = \log_{10}(x-2)$

First graph $y = \log_{10} x$



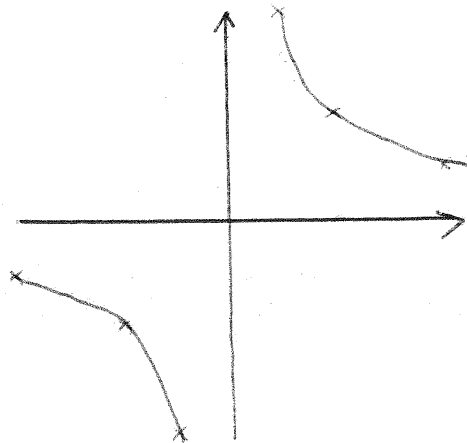
Hyperbola

We need to graph the hyperbola of the form

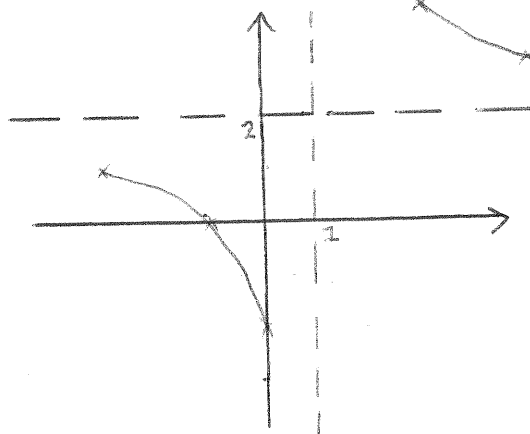
$$1) y = \frac{a}{(x-b)} + c$$

$$2) y = \frac{cx+b}{cx+d}$$

Examples 1) Graph $y = \frac{4}{x}$
Rewrite as $xy = 4$



2) Graph $y = \frac{4}{(x-1)} + 2$
The asymptotes occur at $x=1$
and at $y=2$



2) Graph $y = \frac{2x-4}{x+1}$

Step 1 Find x asymptote
(Look at denominator)
Asymptote at $x = -1$

Step 2 Find y asymptote
As $x \rightarrow \infty$, $y \rightarrow \frac{2x}{x}$
Asymptote at $y = 2$

Step 3 Find where graph cuts x axis
Put $y = 0$
 $0 = \frac{2x-4}{x+1}$
 $x = 2$

Step 4 Find where graph cuts y axis
Put $x = 0$
 $y = \frac{2(0)-4}{0+1} = -4$

