

Name Key Shapes of Algebra Day 1

Some basics:

Window - see different parts of the graph

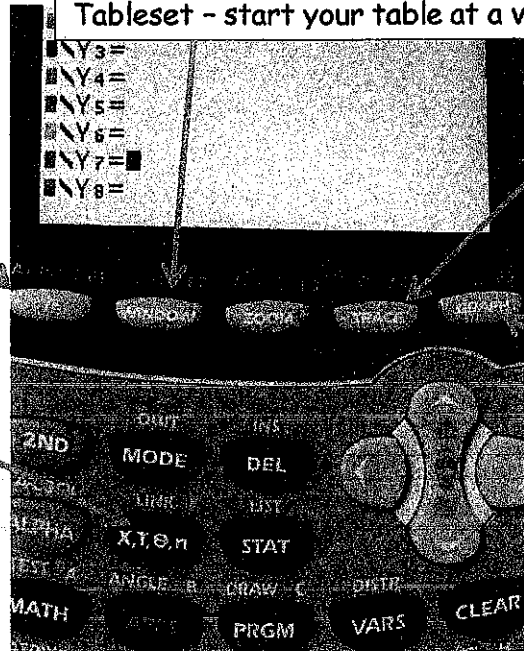
Tableset - start your table at a value.

Enter an equation here (y =)

The variable (x)

Calculate vertex, x-intercepts, other values (2nd, trace)

See the graph
Or the table (2nd then graph)



If you are graphing functions, make sure plots 1, 2, and 3 are NOT highlighted!

```
NORMAL FLOAT AUTO REAL RADIAN MP
Plot1 Plot2 Plot3
Y1=
.....
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
```

```
NORMAL FLOAT AUTO REAL RADIAN MP
FREE TRACE VALUES
WINDOW
Xmin=-10
Xmax=10
Xscl=1
Ymin=-10
Ymax=10
Yscl=1
Xres=1
```

This is your default window. You may need to change it to see different parts of your graph.

Linear Functions

1. $y = 2x - 4$

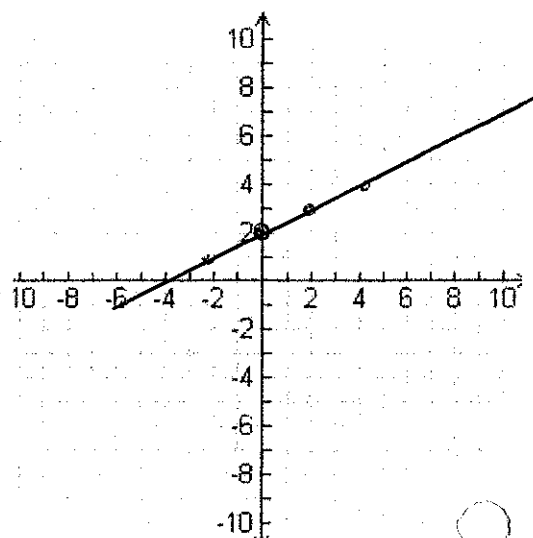
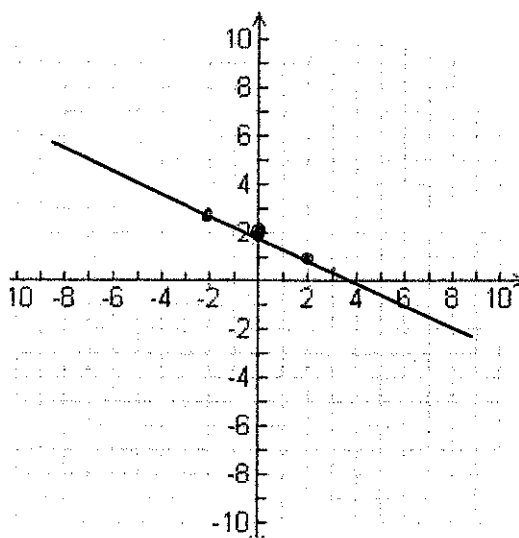
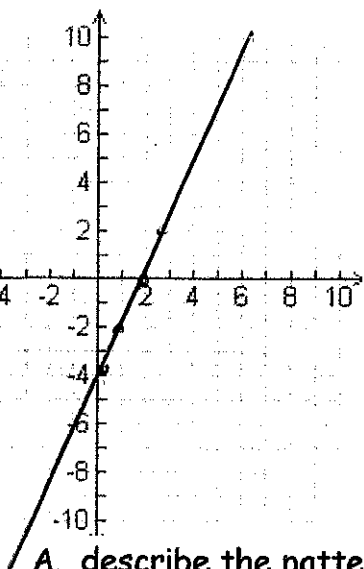
2. $y = -\frac{1}{2}x + 2$

3. $y = \frac{1}{2}x + 2$

x	-3	-2	-1	0	1	2	3
y	-10	-8	-6	-4	-2	0	2

x	-3	-2	-1	0	1	2	3
y	3.5	3	2.5	2	1.5	1	.5

x	-3	-2	-1	0	1	2	3
y	.5	1	1.5	2	2.5	3	3.5



A. describe the patterns in the tables:

constant rate of change - y values go up or down by the same amount.

B. describe the shape of the graphs: lines.

C. Which graph slopes down? What caused it to slope downward?

#2 Coefficient of x is negative.

General equation for a linear function: $y = mx + b$

Linear tables y increases or decreases by the same amount.

Linear graphs lines.

math num #1 abs

Absolute value functions

1. $y = |x|$

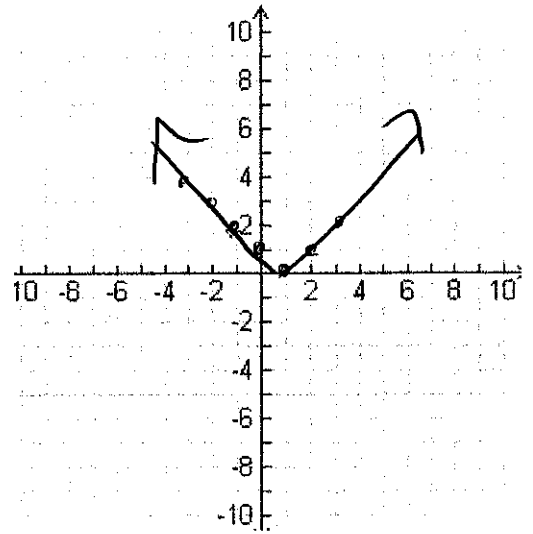
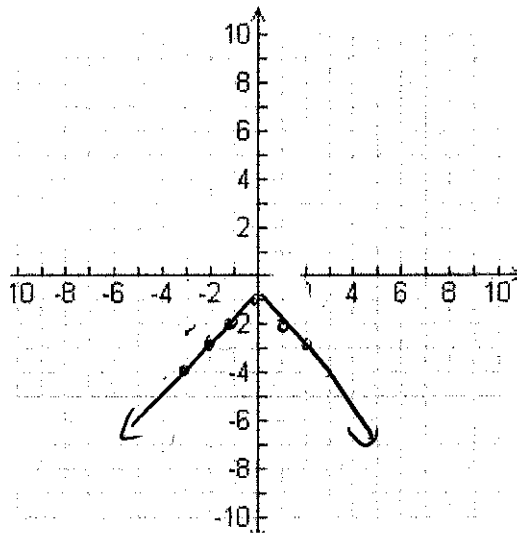
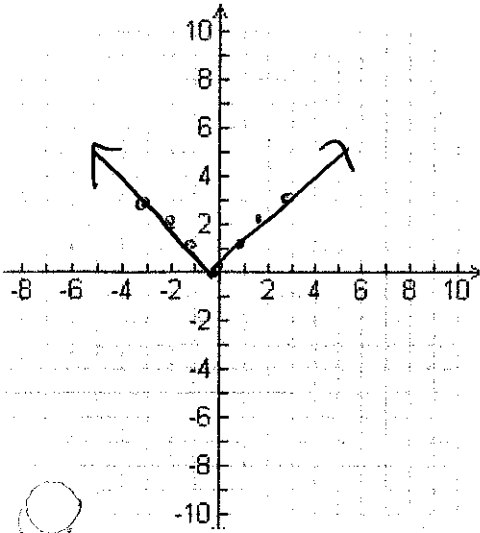
2. $y = -|x| - 1$

3. $y = |x - 1|$

x	-3	-2	-1	0	1	2	3
y	3	2	1	0	1	2	3

x	-3	-2	-1	0	1	2	3
y	-4	-3	-2	-1	-2	-3	-4

x	-3	-2	-1	0	1	2	3
y	4	3	2	1	0	1	2



A. describe the patterns in the tables:

Symmetry/ repeating values. goes down, then back up by the same amount.

B. describe the shape of the graphs: ∇ or Δ

C. Which graph opens down? What caused it to be flipped?

#2 negative in front of abs. value.

General equation for an absolute value function: $y = |x|$

Absolute value tables symmetry & linear/constant pattern.

Absolute value graphs ∇ or Δ

Rational functions (*note, even though you are only recording 7 y values, use the table on your graphing calculator to plot additional points.)

1. $y = \frac{1}{x}$

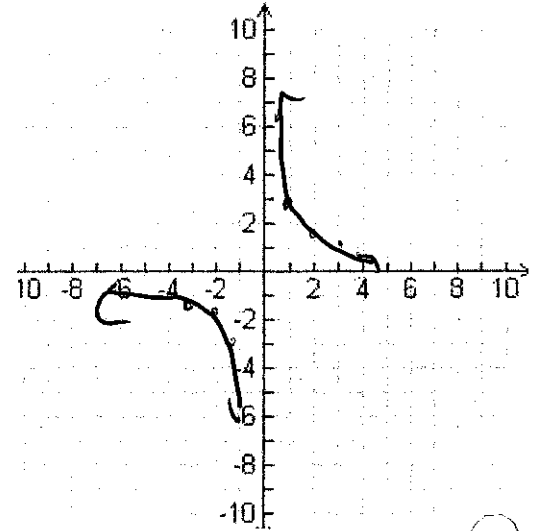
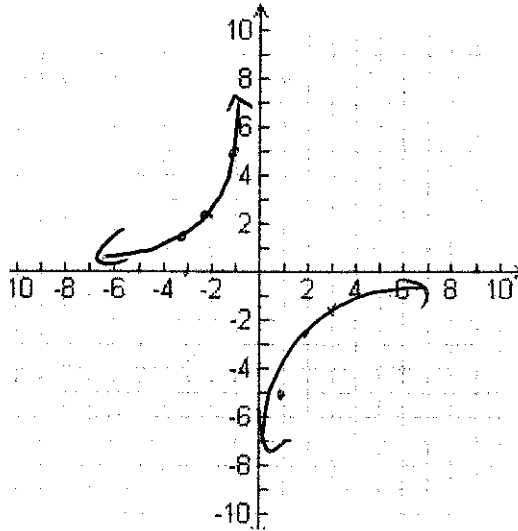
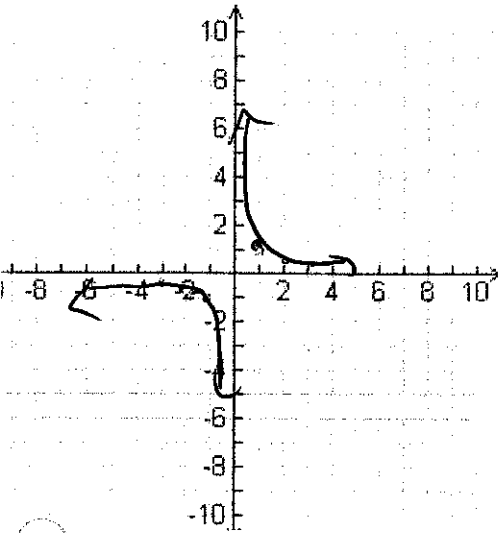
2. $y = -\frac{5}{x}$

3. $y = \frac{3}{x}$

x	-3	-2	-1	0	1	2	3
y	-3	-5	-1	e	1	.5	.3

x	-3	-2	-1	0	1	2	3
y	1.7	2.5	5	e	-.5	-.25	-.17

x	-3	-2	-1	0	1	2	3
y	-1	-1.5	-3	e	3	1.5	1



A. describe the patterns in the tables:

error at 0! can't divide by 0

B. describe the shape of the graphs: two separate curves

C. Why did you get an error message at $x = 0$? can't divide by 0!

General equation for a rational function: x in the denominator

Rational tables error at 0

Rational graphs two separate curves!

Quadratic functions

1. $y = x^2$

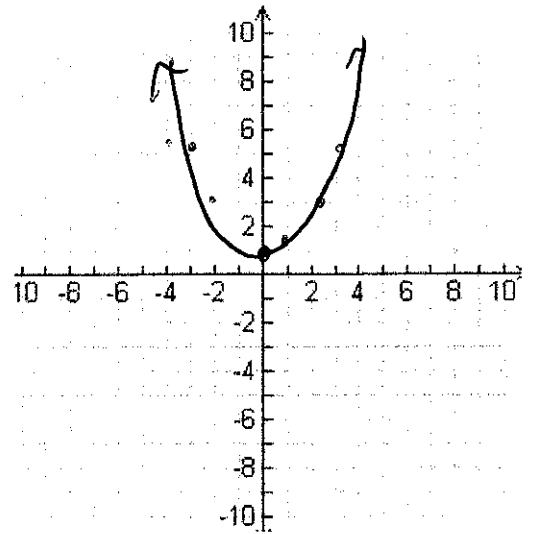
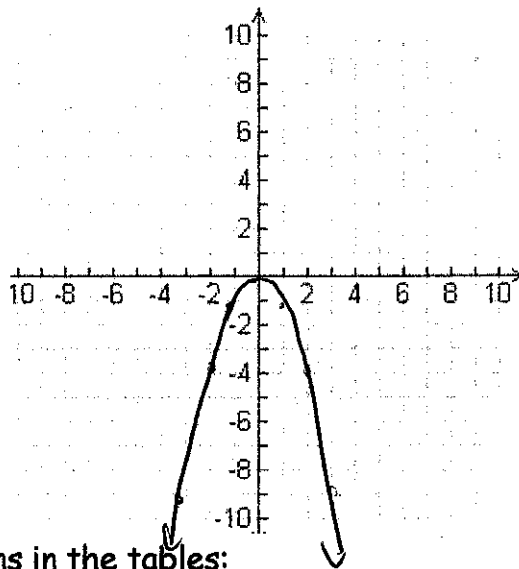
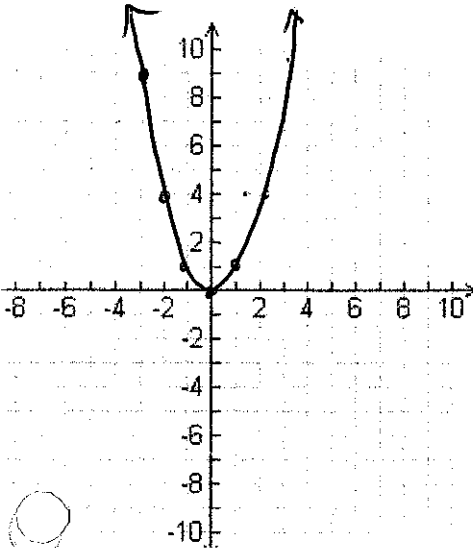
2. $y = -x^2$

3. $y = \frac{1}{2}x^2 + 1$

x	-3	-2	-1	0	1	2	3
y	9	4	1	0	1	4	9

x	-3	-2	-1	0	1	2	3
y	-9	-4	-1	0	1	4	9

x	-3	-2	-1	0	1	2	3
y	5.5	3	1.5	1	1.5	3	5.5



A. describe the patterns in the tables:

symmetry / repeating values, but not a constant (linear) increase then decrease.

B. describe the shape of the graphs:

U or ∩

C. Which graph opens down? What caused it to be flipped?

#2 x^2 is neg.

D. Which graph is wider than the others? What caused it to be wider?

#3 $1/2$ in front of x^2 .

General equation for a quadratic function: $y = x^2$ exponent of 2.

Quadratic tables symmetry, but not a linear pattern.

Quadratic graphs U or ∩

Exponential functions

1. $y = 3^x$

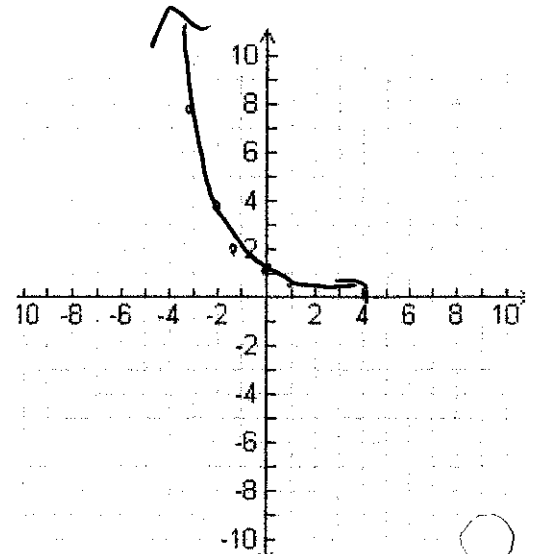
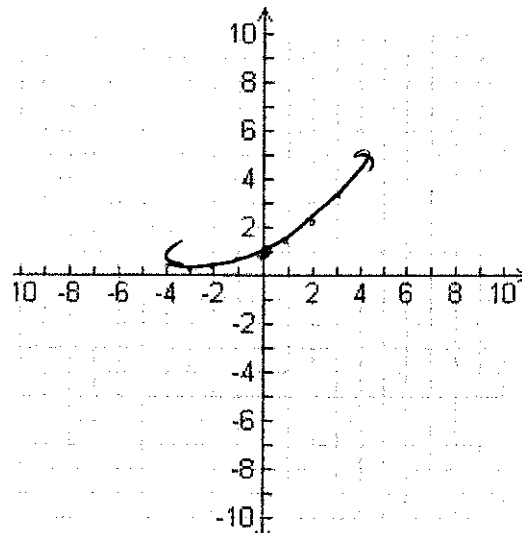
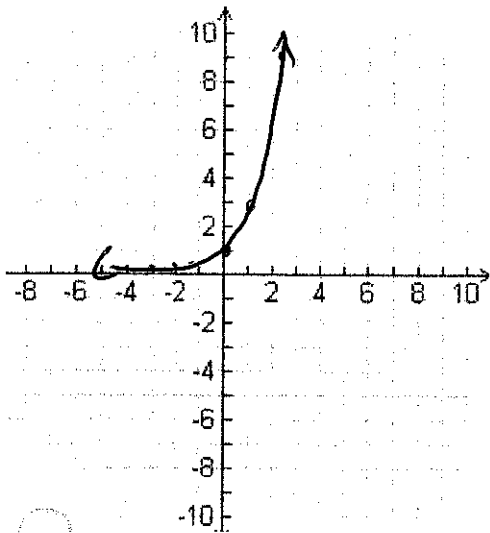
2. $y = 1.5^x$

3. $y = 0.5^x$

x	-3	-2	-1	0	1	2	3
y	$\frac{1}{27}$	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9	27

x	-3	-2	-1	0	1	2	3
y	.3	.4	.7	1	1.5	2.3	3.4

x	-3	-2	-1	0	1	2	3
y	8	4	2	1	.5	.3	.1



A. describe the patterns in the tables:

Rapid increase or decrease - many decimals.

B. describe the shape of the graphs: curves.

C. Which graph is decreasing? Why do you think it is this way?

#3 the base is less than 1
 $0 < \text{base} < 1$

General equation for an exponential function: $y = a^x$ x is exponent.

Exponential tables Rapid increase or decrease

Exponential graphs Curves

Cubic functions

1. $y = x^3$

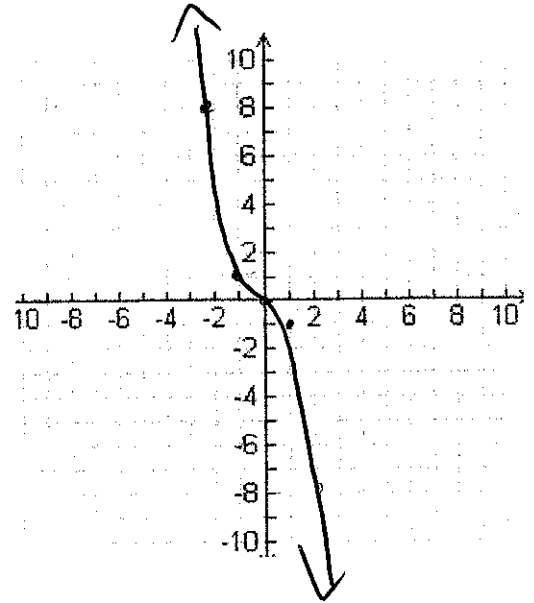
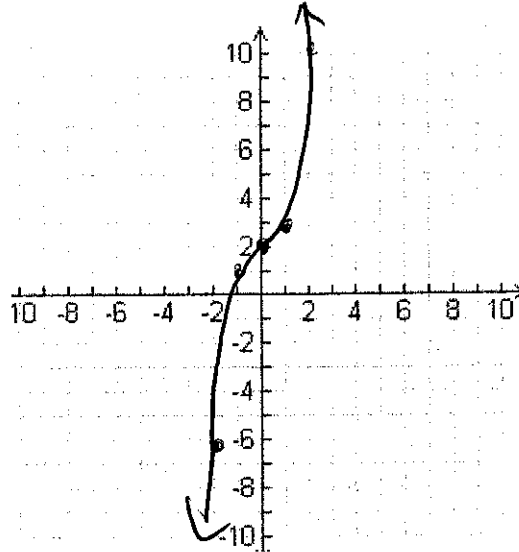
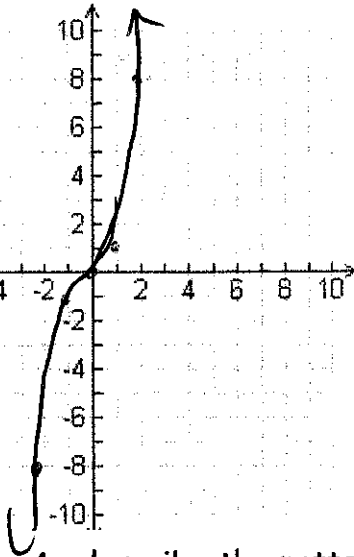
2. $y = x^3 + 2$

3. $y = -x^3$ the opposite of x^3

x	-3	-2	-1	0	1	2	3
y	-27	-8	-1	0	1	8	27

x	-3	-2	-1	0	1	2	3
y	-25	-6	1	2	3	10	29

x	-3	-2	-1	0	1	2	3
y	27	8	1	0	-1	-8	-27



A. describe the patterns in the tables:

Rapid increase and increase

B. describe the shape of the graphs:

opposite direction curves

General equation for a cubic function: $y = x^3$ (power of 3)

Cubic tables Rapid increase and decrease

Cubic graphs opposite directions, tall curves



Square root

1. $y = \sqrt{x}$

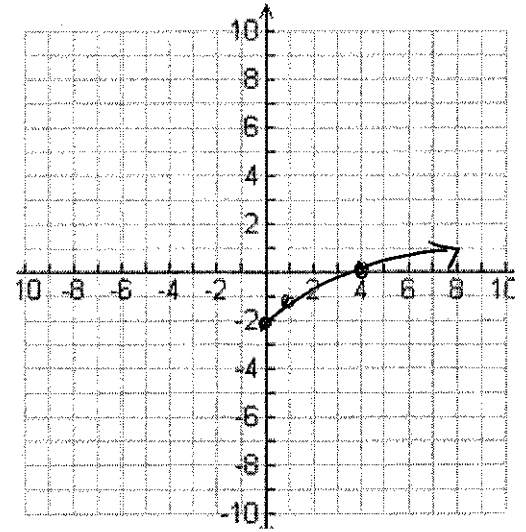
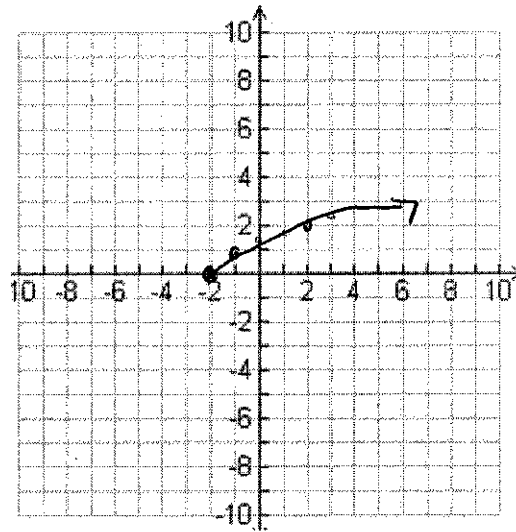
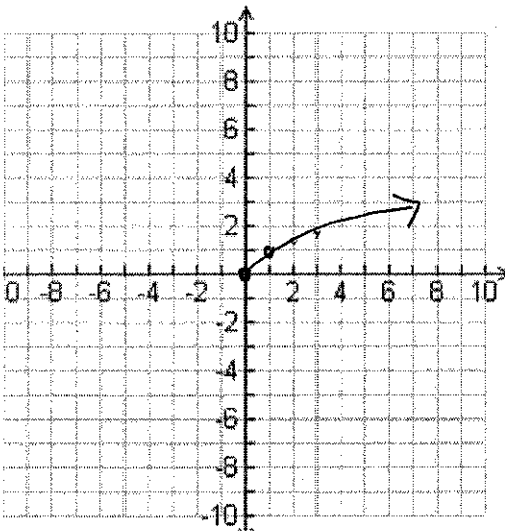
x	-3	-2	-1	0	1	2	3
y	e	e	e	0	1	1.4	1.7

2. $y = (x + 2)^5$

x	-3	-2	-1	0	1	2	3
y	e	0	1	1.4	1.7	2.2	2.7

3. $y = x^{\frac{1}{2}} - 2$

x	-3	-2	-1	0	1	2	3	4
y	e	e	e	-2	-1	-0.6	-0.3	0



A. describe the patterns in the tables:

errors, many decimals.

B. describe the shape of the graphs:

slight curves

General equation for a square root function: $\sqrt{\quad}$ or $x^{0.5}$ $x^{1/2}$

Square root tables may have errors - cant $\sqrt{\text{neg}}$, decimals

Square root graphs slight curve

2000-2001