

Sketching Graphs

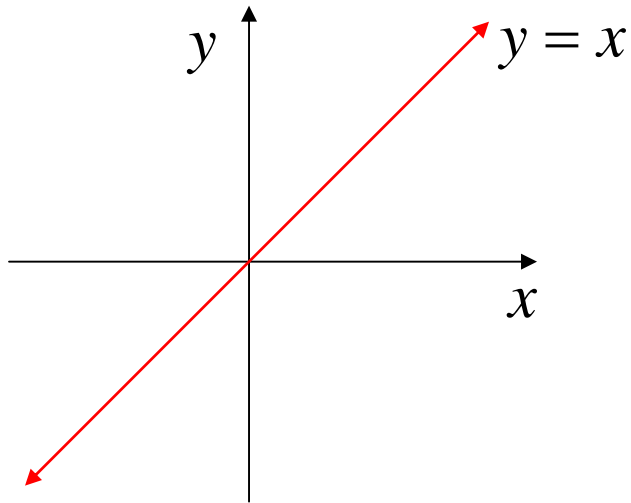
- * Numbers on axes must be evenly spaced
- * y intercept occurs when $x = 0$
- * x intercept occurs when $y = 0$

Once the intercepts have been found, curves are easy to sketch, if you know the basic shape.

If in doubt use a table of values and plot some points

Basic Curves

(1) Straight Lines

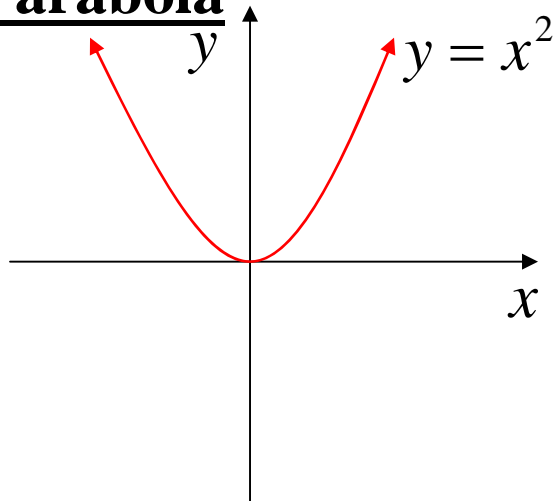


$$y = mx + b$$

power '1'

power '1'

(2) Parabola



$$y = ax^2 + bx + c$$

power '1'

power '2'

x intercepts: solve $ax^2 + bx + c = 0$

vertex: halfway between x intercepts

e.g. find the x intercepts and vertex of $y = x^2 - 4x + 3$

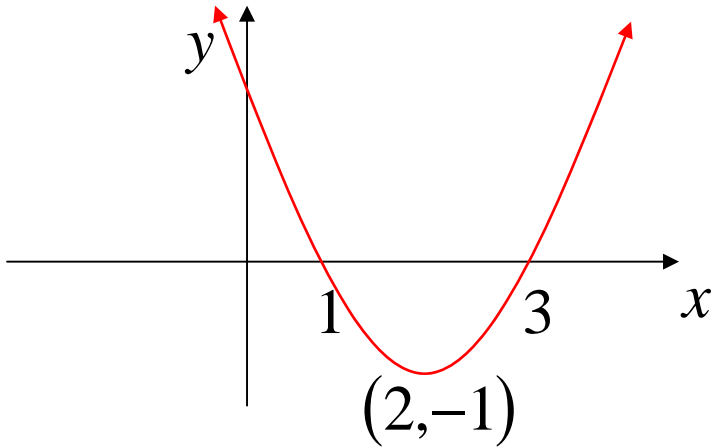
$$y = (x - 2)^2 - 1 \quad \underline{x \text{ intercepts:}} \quad (x - 2)^2 = 1$$

$$\therefore \underline{\text{vertex } (2, -1)}$$

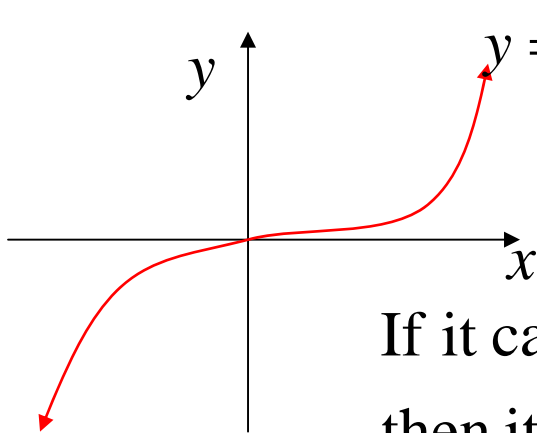
$$x - 2 = \pm 1$$

$$x = 2 \pm 1$$

$$\underline{x = 1 \text{ or } x = 3}$$



(3) Cubic



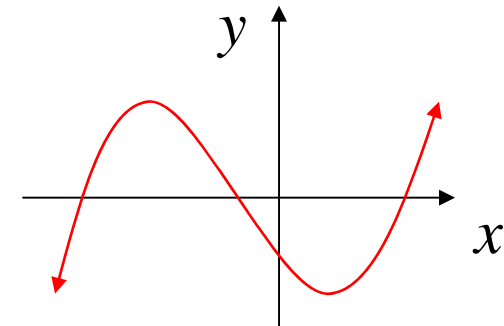
power '1'

$$(y) = ax^3 + bx^2 + cx + d$$

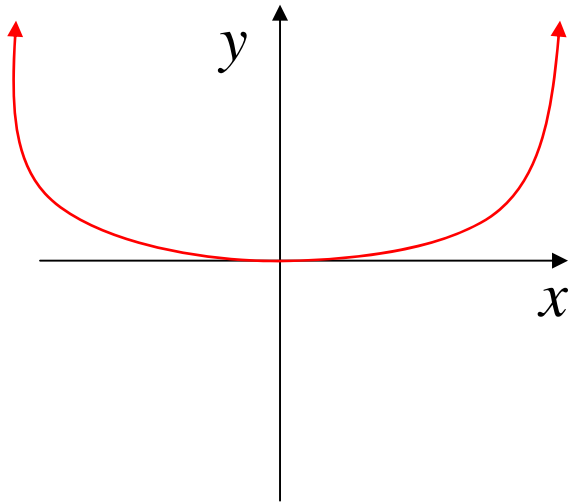
power '3'

If it can be factorised to $y = a(x + k)^3$
then it will look like the basic cubic.

Otherwise;



(4) Higher Powers



even

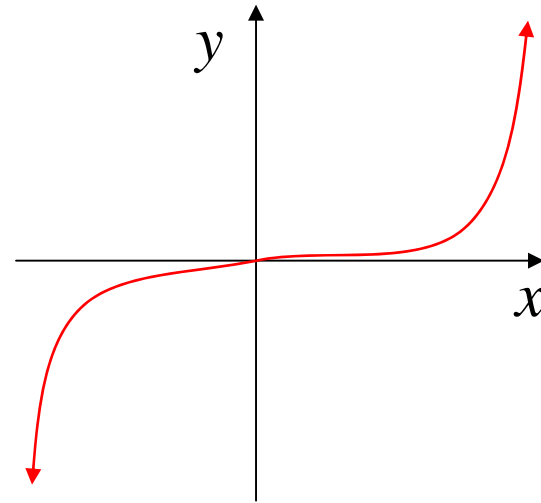
$$y = x^4$$

⋮

$$y = x^6$$

⋮

etc



odd

$$y = x^5$$

⋮

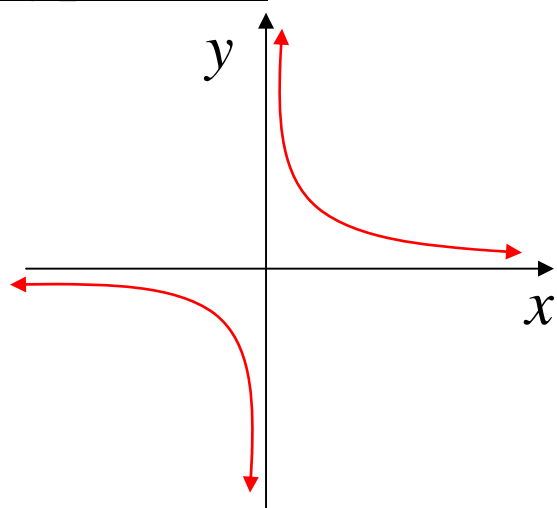
$$y = x^7$$

⋮

etc

As power gets bigger, curve gets; - flatter at base
- steeper at the sides

(5) Hyperbola



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

OR

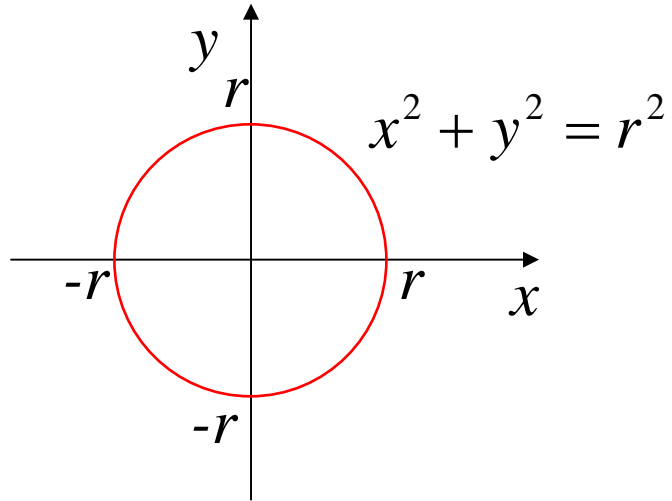
$$xy = 1$$

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

The variables y and x in the fraction are circled in blue, with blue arrows pointing to the explanatory text below.

one power on top of a fraction,
one power on bottom of fraction

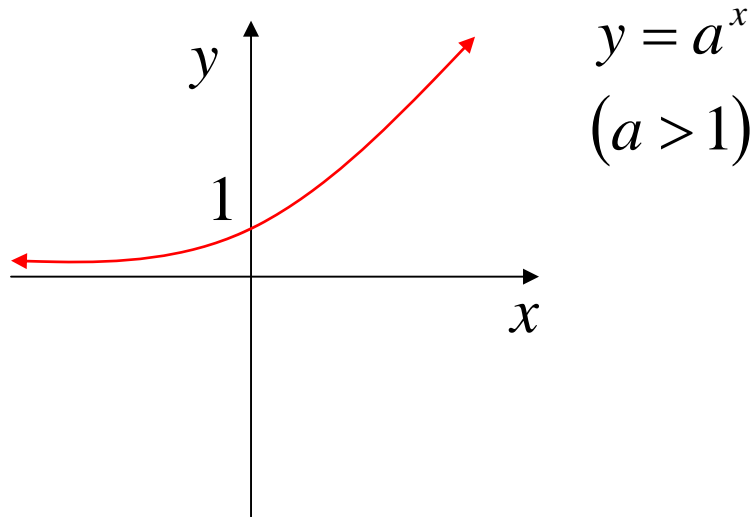
(6) Circle



$$x^2 + y^2 = r^2$$

both power '2'
coefficients are the same

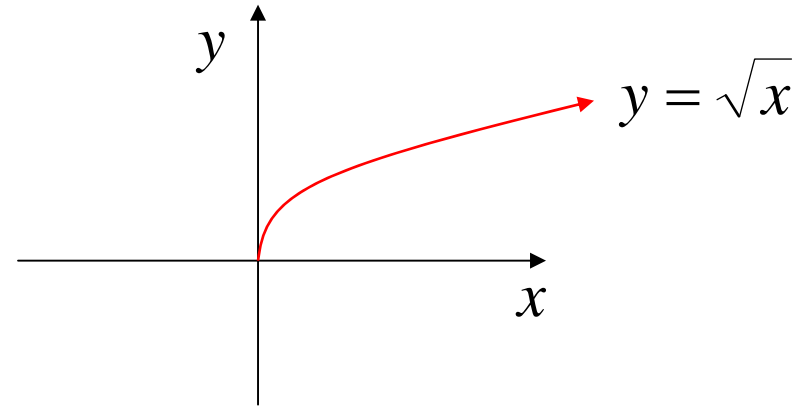
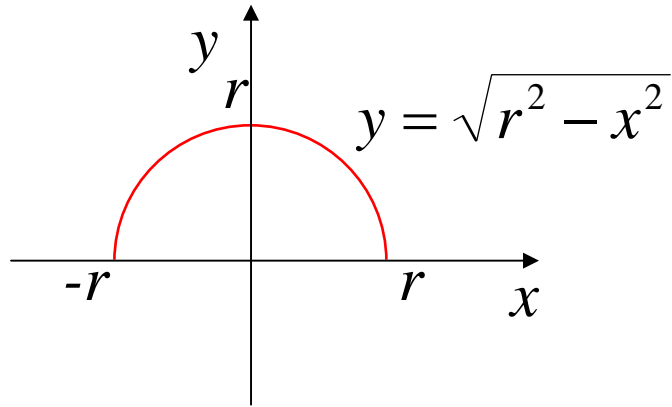
(7) Exponential



$$y = a^x$$

pronumeral in the power

(8) Roots



to tell what the curve looks like, square both sides

$$y = \sqrt{r^2 - x^2}$$

$$y^2 = r^2 - x^2$$

$$x^2 + y^2 = r^2$$

\therefore circle

$$y = \sqrt{x}$$

$$y^2 = x$$

\therefore parabola

$+\sqrt{\quad}$ means top half

$-\sqrt{\quad}$ means bottom half

**Exercise 2G; 1adeh, 2adgk, 3bdf,
5aeh, 7acegi, 8ad, 9a, 11c, 13acd,
15bd, 17***