

## 20 - Graphs

### Speed - Time Graphs

Acceleration → find positive gradient of the line,  $m/s^2$

Deceleration → find negative gradient,  $m/s^2$

Horizontal line above 0  $m/s^2$  = Constant Speed,  $m/s$

Distance = Area under the line

### Estimation of Area under the curve

- Concaving curve = underestimate
- Convex curve = overestimate

### Equation of a circle

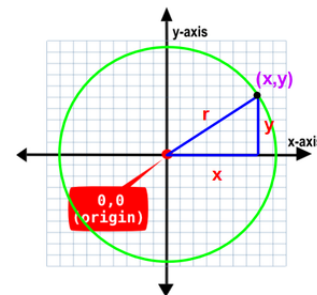
$$x^2 + y^2 = r^2$$

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

e.g.  $(x + 3)^2 + (y - 1)^2 = 16$

$$r = \sqrt{16} = 4$$

Radius cannot be a negative value



The equation of a circle centered at the origin

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

Centre = multiply integers by -1 = inverse a,  
inverse b  
= (-3,1)

### Transformations of graphs, $y=f(x)$

Graph	Transformation	Description
$y = f(x + a)$	Translation	Graph moves a units to the left
$y = f(x - a)$	Translation	Graph moves a units to the right
$y = f(x) + a$	Translation	Graph moves a units up
$y = f(x) - a$	Translation	Graph moves a units down
$y = -f(x)$	Reflection in x axis	Flips graph - inverses all $\pm$ y coordinates
$y = f(-x)$	Reflection in y axis	Flips sideways - inverses all $\pm$ x coordinates

### Inside bracket = x axis

$f(x-a)$  vector = a  
o

in vector, a = inverse the sign in the bracket

### Outside bracket = y axis

$f(x)+a$  vector = o  
a

in vector, a = same as it is outside the bracket

if  $y = x^2$  is  $y = f(x)$ , then:

- $y = x^2 + 3$  →  $y = f(x) + 3$  — up +3 on y-axis
- $y = (x+3)^2$  →  $y = f(x + 3)$  — -3 (left) on x-axis
- $y = (x - 3)^2 - 1$  →  $y = f(x - 3) - 1$  — down -1 on y-axis, left -3 on x-axis
- $y = -x^2 + 3$  →  $y = -f(x) + 3$  — flips then up +3 on y-axis