→ 
$$(x-a)^2 + (y-b)^2 = r^2$$
 with r=5 and  $(a,b)=(2,3)$ .
→  $(x-2)^2 + (y-3)^2 = 5^2$ 
→  $x^2-4x+4 + y^2-6y+9 = 25$ 
→  $x^2+y^2-4x-6y-12=0$ .
2) Find the centre and radius of the circle  $x^2+y^2-2x+4y-4=0$ 
→  $(x^2-2x) + (y^2+4y) - 4 = 0$ 
→  $(x-1)^2 + (y+2)^2 - 4 = 5$ 
→  $(x-1)^2 + (y+2)^2 = 9$ 
→ Centre  $(1, -2)$  and radius 3.

## Linear Programming

Maximising the Objective Function

-If P=ax+by then draw the line, giving P any value.

-It can then be seen which of the vertices will give the maximum value for P.

-The feasible region is the region that is satisfied by a number of inequalities and is the region on your graph that is not shaded. -The objective function is the function that is to be maximised or minimised.

For angles of any size:

-If a point in the co-ordinate system has co-ordinates (x,y) and is a distance r from the origin then the ratios are defined as follows:

 $\sin\theta = \frac{y}{r}$   $\cos\theta = \frac{x}{r}$   $\tan\theta = \frac{y}{x}$ 

## **Principal Angles**

-When you use your calculator to find an angle, only one angle can be shown, which is called the Principle angle.

-However, there are two angles in the range of  $0^\circ \le \theta \le 360^\circ$ .

-If the angle in the first quadrat is  $\theta$  then the equivalent angles in the second, third and fourth quadrants are 180- $\theta$  (sin), 360- $\theta$  (cos) and 180+ $\theta$  (tan).

- Cosine curve= 360 x
- Sine curve= 180 x
- Tan curve= 180 + x

	Maximum	Minimum
Shape	$\bigcap$	$\bigcup$
Gradient test: dy dx is:	/\ + 0 -	\/ - 0 +

## Sketching a Curve:

-The essential details of a curve to be sketched are:

- The co-ordinates and nature of any turning points.
- The intercepts on the x- and y-axes.

-To determine whether a turning point is a maximum or a minimum you can calculate the value of the gradient on each side of the turning point and at the turning point.

• For example:  
Investigate the nature of the Quinting point of the curve  

$$y = 2x^3 - 3x^2 - 12x + 24$$
 is in the positive of odrant.  
 $dy = 40x^2 - 6x - 12$   
 $dy = 40x^2 -$ 

## **Integration**

-The reverse of differentiation:

If 
$$\frac{dy}{dx} = ax^n$$
 then  $y = \frac{a}{n+1}x^{n+1} + c$ 

-C is called the constant of integration and if you differentiate a constant you get 0, so when you integrate you need to write it in.

• For example: