www.jeeducation.com.au JE MATHS

JE MATHS

JE MATHS

#### Stage 1:

# 1. (2, 2)

$$(0)(-1)$$

$$(1)(-2)$$

$$(3)(-3)$$

$$(-2)(0.5)$$

$$(5)(-7)$$

$$(-1)$$

$$(-56)$$

### Stage 3:

1. 
$$(x = a \text{ and } x = (m - 3a)/3)$$

$$(m = 6a)$$

$$(f'(x) = 6x);$$

$$(x = m/6)$$

$$f(x) = 6x$$
;  
 $f(x) = 6x$ ;  
 $f(x) = 6x$ ;

2. 
$$(x = (1 + m)/6)$$

$$(f'(x) = 6x - 1)$$

3. 
$$(x = m/2K)$$

$$f'(x) = 2Kx$$

4. 
$$(x = (m - B)/2A)_B MATHS$$

$$(f'(x) = 2Ax + B)$$

5. 
$$(x = -b/2m)$$

$$(b = +- r(-4m))$$

# Stage 2:

$$(0) (-r2/4)$$

$$(r(9-x^2)/x)$$

$$(x = -3r2/2)$$

2. 
$$C(0, -2), r = 4$$

$$(-r(16-x^2)/x)$$

$$(x/r(16 - x^2))$$

$$(-3r7/7)$$

$$(-2r2, 2r2)$$

3. 
$$C(1, 0), r = 5$$

$$(r[25 - (x-1)^2]/(x-1))$$

$$(1 - x)/r(25 - (x - 1)^2)$$

$$(3x + 4y - 28 = 0)$$
  
 $(x = 1 - r5)$ 
JE MATHS

$$(x = 1 - r5)$$

4. 
$$(5, 0)$$
,  $r = 4$ , lower semicircle

$$(x-5)/r[16-(x-5)^2]$$

5. 
$$(4, 7)$$
,  $r = 3$ , upper

$$(4-x)/r[9-(4-x)^2]$$

6. 
$$(-1, 2)$$
,  $r = r3$ , lower

$$(1+x)/r[3-(1+x)^2]$$

7. 
$$(2, 9), r = 2, lower$$

$$(x-2)/r(4x-x^2)$$

JE MATHS

JE MATHS

JE MATHS

JE MATHS

JE MATHS

#### Stage 1:

1. (i) 
$$m = \frac{8}{4} = 2$$

$$f'(1) = 2$$

(ii) 
$$f'(0) = 0$$

$$f'(0.5) = \frac{3}{3} = 1$$

$$f'(1.5) = \frac{6}{2} = 3$$

JE MATHS

2. 
$$f'(0) = \frac{4}{2} = 2$$

$$f'(1) = \frac{4}{2} = 2$$

3. (a) 
$$f'(x) = 0$$
  $\mathbb{B}^{MATHS}$ 

(c) 
$$f'(x) = 5$$

(e) 
$$f'(x) = \frac{5}{2}$$

# 4. (a) f(x) = 3 - 6x - 2 + 6x = 1

$$f'(x) = 0$$

(b) 
$$f(x) = \frac{1}{2}(3 - 11x - 5 + 9x) = -1 - x$$
  
 $f'(x) = -1 - 0 = -1$ 

(c) 
$$f(x) = 4x(-14) = -56x$$
  
 $f'(x) = -56$ 

(d) 
$$f(x) = \frac{2x - b - c}{a}$$
$$f'(x) = \frac{2}{a}$$

(e) 
$$f(x) = \frac{PS + SQx + PR - QRx}{RS}$$
$$f'(x) = \frac{SQ - QR}{RS}$$

$$_{\text{JE MATHS}}$$
  $f'(-0.5) = \frac{-3}{3} = -1$ 

$$f'(-1) = \frac{-4}{2} = -2$$

$$f'(-1.5) = \frac{-6}{2} = -3$$
If MATHS

$$f'(0.5) = \frac{-6}{4} = -1.5$$

$$f'(1.5) = \frac{2}{4} = 0.5$$

(b) 
$$f'(x) = 0$$

(d) 
$$f'(x) = -7$$

JB MATHS (f) 
$$f'(x) = \frac{-21}{4}$$

JE MATHS

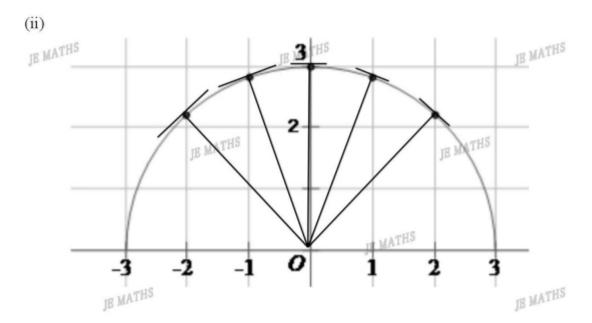
JE MATHS

JE MATHS

JE MATHS

## Stage 2:

1. (a) (i)  $(-2,\sqrt{5}), (-1,2\sqrt{2}), (1,2\sqrt{2}), (0,3), (2,\sqrt{5})$ 



(iii) 
$$f'(0) = 0$$

JE MATHS

$$f'(1) = \frac{-1}{2\sqrt{2}} = -\frac{\sqrt{2}}{4}$$

$$f'(-1) = \frac{1}{2\sqrt{2}} = \frac{\sqrt{2}}{4}$$

$$f'(2) = \frac{-2}{\sqrt{5}} = \frac{42\sqrt{5}}{5}$$

$$f'(-2) = \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$$
 JE MATHS

$$f'(-2) = \frac{-2}{\sqrt{5}} = \frac{-2\sqrt{5}}{5}$$

(b) (i) 
$$m_{OP} = \frac{\sqrt{9-x^2}-0}{8x^{3/2}} = \frac{\sqrt{9-x^2}}{x}$$

JE MATHS

(ii) 
$$m_{PT}$$
  $\frac{\sqrt{9-x^2}}{x} = -1$ 

JE MATHS

$$f'(x) = \frac{-x}{\sqrt{9 - x^2}}$$

JE.Maths

(iii) 
$$1 = \frac{-x}{\sqrt{9-x^2}}$$

$$\sqrt{9-x^2} = -x$$

 $\text{JE MATHS}_{X}^{\text{HS}_2} = 9 - x^2$ 

JE MATHS

JE MATHS

$$2x^2 = 9$$

$$x^2 = \frac{9}{2}$$

JE MATHS

JE MATHS

$$x = \frac{-3}{\sqrt{2}}$$

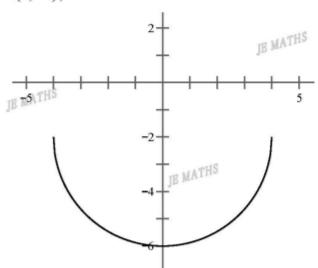
$$x = \frac{-3\sqrt{2}}{2}$$

JE MATHS

JE MATHS

2. (i) C(0,-2), r=4

JE MATHS



JE MATHS

(ii)  $m = \frac{-\sqrt{16 - x^2}}{x}$ 

JE MATHS

(iii) 
$$_{\parallel}m_{PT} \stackrel{\text{def}}{=} \frac{x}{\sqrt{16-x^2}}$$

JE MATHS

$$f'(x) = \frac{x}{\sqrt{16 - x^2}}$$

(iv) (a) 
$$f'(-1) = \frac{-\sqrt{15}}{15}$$

$$\frac{-1}{\sqrt{16-1^2}} = \frac{-1}{\sqrt{15}}$$
JE MATHS

(b)  $f'(2) = \frac{\sqrt{3}}{3}$ 

JE MATHS

JE MATHS

JE MATHS

$$\frac{2}{\sqrt{16-2^2}} = \frac{2}{\sqrt{12}} = \frac{2\sqrt{3}}{6^{5}} \text{ ATHS}$$

JE MATHS

(c) 
$$f'(-3) = \frac{-3\sqrt{7}}{7}$$

 $\frac{-3}{\sqrt{16-3^2}} = \frac{-3}{\sqrt{7}}$ IB MATHS

JE MATHS

(v) 
$$\frac{x}{\sqrt{16-x^2}} = -1$$

 $x = -\sqrt{16 - x^2}$ 

JE MATHS

JE MATH
$$^{S}x^{2} = 16 - x^{2}$$

JE MATHS

$$2x^2 = 16$$

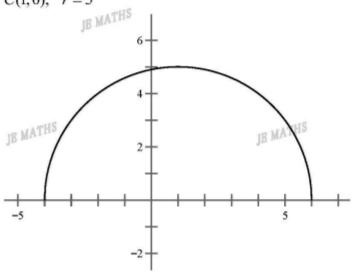
 $x^2 = 8$ 

JE MATHS

$$x = -2\sqrt{2}$$
 (omit positive)

JE MATHS

3. (i) C(1,0), r=5



(ii) 
$$m = \frac{\sqrt{25 - (x - 1)^2}}{x - 1}$$

(iii) 
$$Im_{PT}^{\text{MATHS}} = \frac{1-x}{\sqrt{25-(x-1)^2}}$$

JE MATHS

JE MATHS

$$f'(x) = \frac{1-x}{\sqrt{25-(x-1)^2}}$$

JE MATHS

JE MATHS

JE MATHS

(iv) 
$$f'(x) = \frac{1-4}{\sqrt{25-(1-4)^2}} = -\frac{3}{4}$$

$$y = \sqrt{25 - (4 - 1)^2} = 4$$

$$y-4=\frac{-3}{4}(x^{\text{MATHS}})$$

JE MATHS

$$4y-16=-3x+12$$

$$3x + 4y - 28 = 0$$

JE MATHS

(v) 
$$\frac{\text{JE MATHS}}{\sqrt{25 - (x - 1)^2}} = \frac{1}{2}$$

 $2-2x = \sqrt{25-(x-1)^2}$  JE MATHS

$$4 - 8x + 4x^2 = 25 - x^2 + 2x - 1$$

$$0 = 5x^2 - 10x - 20$$

JE MATHS

JE MATHS

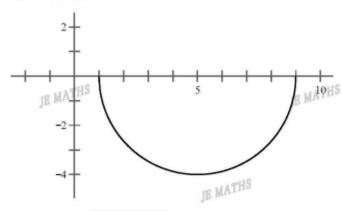
$$0 = x^2 - 2x + 4 \text{MATHS}$$

$$x = \frac{2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot -4}}{2}$$

 $x = 1 + \sqrt{5}$  (omit positive)

JE MATHS

4. (i) C(0,5), r=4



JE MATHS

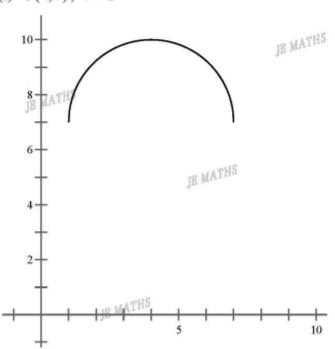
(ii)  $m = \frac{-\sqrt{16 - (x - 5)^2}}{x - 5}$ 

$$f'(x) = \frac{x-5}{\sqrt{16 - (x-5)^2}}$$

JE MATHS

JE MATHS

5. (i) C(4,7), r=3



JE MATHS

JE MATHS

JE MATHS

JE MATHS

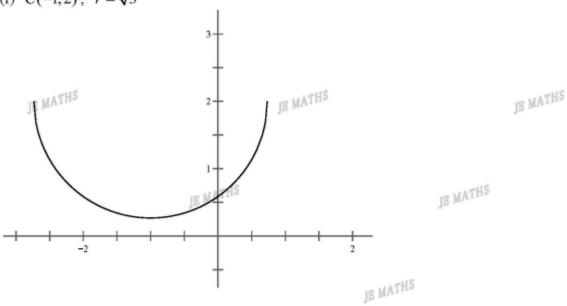
(ii)  $m = \frac{\sqrt{9 - (4 - x)^2}}{\text{JB MATHS } x - 4}$ 

JE MATHS

JE MATHS

 $f'(x) = \frac{4-x}{\sqrt{9-(4-x)^2}}$ 

6. (i) C(-1,2),  $r = \sqrt{3}$ 



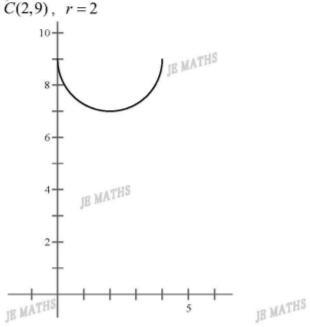
(ii)  $m = \frac{-\sqrt{3 - (x+1)_{||\cdot||}^2}}{x+1}$ 

$$f'(x) = \frac{x+1}{\sqrt{3-(x+1)^2}}$$

JE MATHS

7. (i)  $f(x) = 9 - \sqrt{4 - 4 + 4x - x^2} = 9 - \sqrt{4 - (x - 2)^2}$ 

JE MATHS C(2,9), r=2 10 +



JE MATHS

(ii)  $m = \frac{-\sqrt{4x - x^2}}{x - 2}$ 

$$f'(x) = \frac{x - 2}{\sqrt{4x - x^2}}$$

## Stage 3:

1. (a) (i)  $3x^2 - 3a^2 = mx - ma$ 

$$3(x+a)(x-a) = m(x-a)$$

$$\int_{\mathbb{R}} \frac{1}{MATHS} x + 3a = m$$

$$x = \frac{m - 3a}{3} \text{ or } x = a$$

JE MATHS

(ii)  $a = \frac{m - 3a}{3}$  3a = m - 3am = 6a

JE MATHS

(iii)  $f'(x) = m_{PT} = 6x$ 

JE MATHS

(b) (i) 
$$3x^2 = mx^2 + b^{ATHS}$$
  
 $0 = 3x^2 - mx - b$   
 $x = \frac{m \pm 0}{2 \cdot 3} = \frac{m}{6}$ 

JE MATHS

(ii) MATHS m = 6xf'(x) = m = 6x JE MATHS

2. (i)  $3x^2 - x + 2 = mx + b$ 

 $0 = 3x^{2} - x - mx + 2 - b$   $x = \frac{m + 1 \pm 0}{2 \cdot 3} = \frac{m + 1}{\mathbb{E} MATHS}$ 

JE MATHS

(ii) m+1=6x m=6x-1 f'(x)=m=6x-1JE MATHS

JE MATHS

3. (i) 
$$kx^2 = mx + b$$

$$0 = kx^2 - mx - b$$
$$x = \frac{m \pm 0}{m} - \frac{m}{m}$$

$$x = \frac{m \pm 0}{18 \text{ MA}^2 2k} = \frac{m}{2k}$$

JE MATHS

JE MATHS

JE MATHS

(ii) 
$$2kx = m$$

$$f'(x) = m = 2kx$$

JE MATHS

JE MATHS

4. (i) 
$$Ax^2 + Bx + c = mx + b$$

$$0 = Ax^2 + (B-m)x + C - b$$

$$x = \frac{m - B \pm 0}{2A}$$

JE MATHS

(ii) 
$$2Ax = m - B$$

$$m = 2Ax + B$$

$$f'(x) = m = 2Ax + B$$

5. (i)  $\frac{1}{x} = mx + b$ 

JE MATHS

$$1 = mx^2 + bx$$

$$0 = mx^2 + bx - 1$$

$$x = \frac{-b \pm 0}{2m} = \frac{-b}{2m}$$

JE MATHS

(ii) 
$$1 = m \left(\frac{-b}{2m}\right)^2 + b \left(\frac{-b}{2m}\right)^2$$

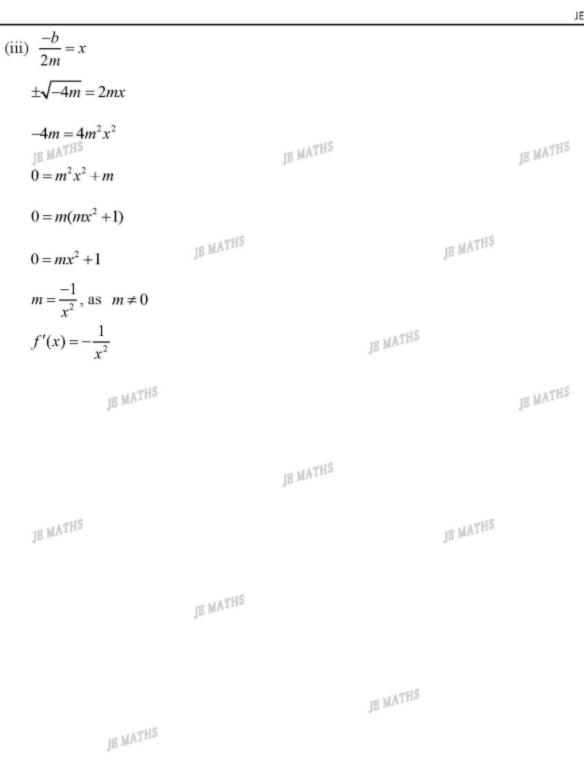
$$1 = \frac{mb^2}{4m^2} + \frac{-b^2}{2m}$$

$$4m = b^2 - 2b^2$$

$$b^2 = -4m$$

$$b = \pm \sqrt{-4m}$$

JE.Maths



JE MATHS JE MATHS JE MATHS