

9.

# Curve Sketching



What do we need to know to sketch the curve?

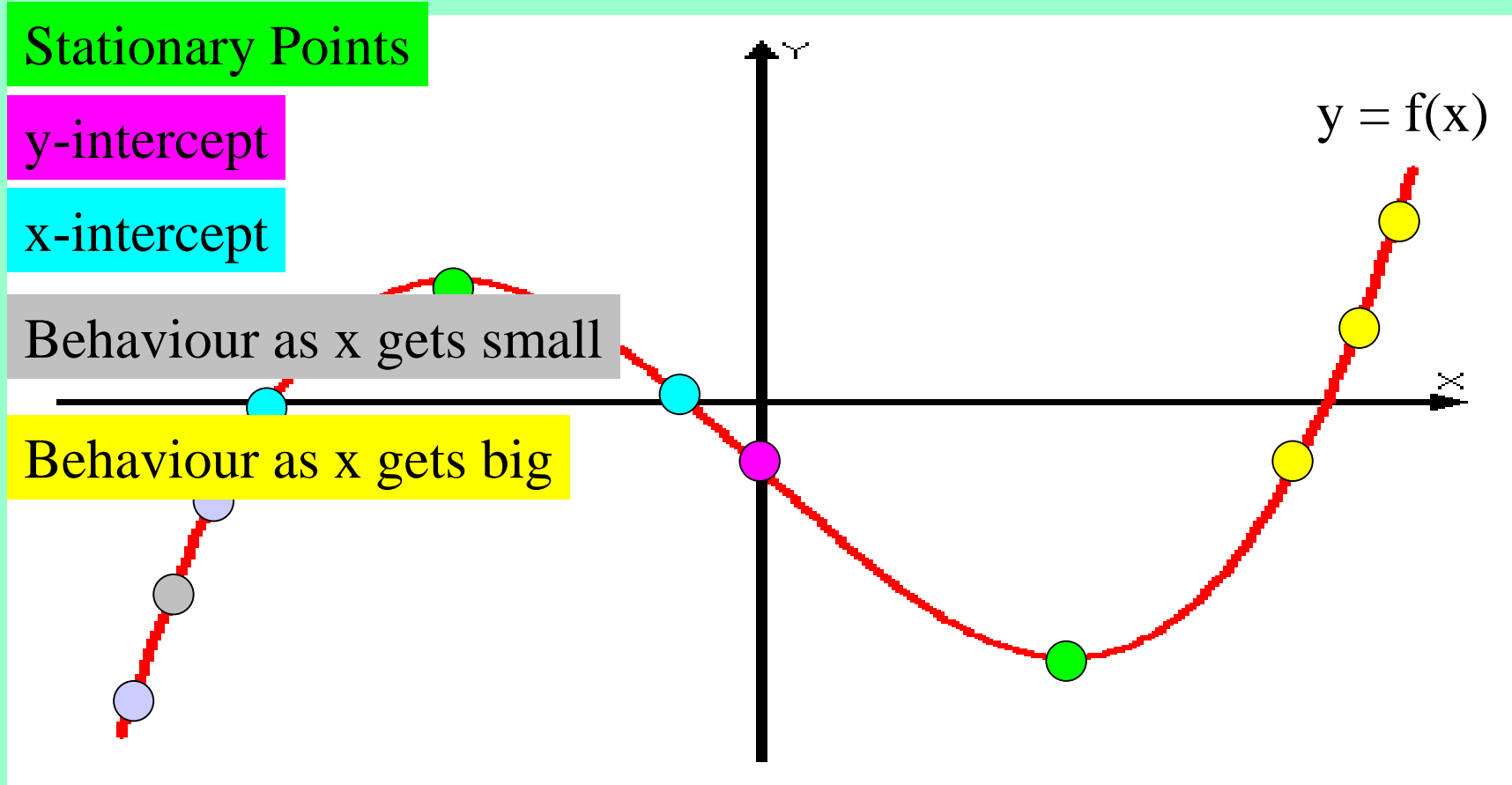
Stationary Points

y-intercept

x-intercept

Behaviour as  $x$  gets small

Behaviour as  $x$  gets big



If asked to sketch this curve what information do you think you would need?

## Curve Sketching

Copy the following:

If asked to sketch a curve we need to establish the following:

1. y-intercept ( $x = 0$ )

2. x-intercept(s) ( $y = 0$ )

3. Stationary Points ( $dy/dx = 0$ )

4. Behaviour as x gets very big and very small

$x \rightarrow \infty$

$x \rightarrow -\infty$

## Example 1

Sketch the graph of  $y = 8x^3 - 3x^4$

### Solution:

1. Find y-intercept ( $x = 0$ )

2. Find x-intercept ( $y = 0$ )

$$y = 8x^3 - 3x^4$$

$$y = 8(0)^3 - 3(0)^4 = 0$$

y-intercept is (0,0)

$$0 = 8x^3 - 3x^4$$

$$0 = x^3(8 - 3x)$$

$$x^3 = 0 \quad \text{or} \quad (8 - 3x) = 0$$

$$3x = 8$$

$$x = 0$$

$$x = \frac{8}{3}$$

x-intercepts (0,0) &  $(\frac{8}{3}, 0)$

## Example 1

Sketch the graph of  $y = 8x^3 - 3x^4$

**Solution:**

**3. Find Stationary Points and their nature ( $dy/dx = 0$ )**

$$y = 8x^3 - 3x^4$$

$$\frac{dy}{dx} = 24x^2 - 12x^3$$

At SP's  $dy/dx = 0$

$$0 = 24x^2 - 12x^3$$

$$0 = 12x^2(2 - x)$$

$$12x^2 = 0 \quad \text{or} \quad (2 - x) = 0$$

$$x = 0$$

$$x = 2$$

$$y = 8(0)^3 - 3(0)^4 \quad y = 8(2)^3 - 3(2)^4$$

$$y = 0$$

$$y = 16$$

## Example 1

Sketch the graph of  $y = 8x^3 - 3x^4$

$$\frac{dy}{dx} = 24x^2 - 12x^3$$

**Solution:**


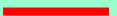

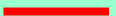

**3. Find Stationary Points and their nature ( $dy/dx = 0$ )**

$$\frac{dy}{d(-1)} = 24(-1)^2 - 12(-1)^3 = 36$$

$$\frac{dy}{d(1)} = 24(1)^2 - 12(1)^3 = 12$$

$$\frac{dy}{d(3)} = 24(3)^2 - 12(3)^3 = -108$$

**SP's are (0,0) and (2,16)**

<b>X</b>	$0^-$	$0$	$\longrightarrow$	$2$	$2^+$
$\frac{dy}{dx}$	+ve	0	+ve	0	-ve
<b>Slope</b>					

**(0,0) is a rising point of inflexion**

**(2,16) is a maximum tp**



## Example 1

Sketch the graph of  $y = 8x^3 - 3x^4$

Solution:

4. Behaviour as  $x$  gets very big and very small

$$x \rightarrow \infty$$
$$x \rightarrow -\infty$$

Even Power - +ve  
Odd Power - get what you started with

5. Plot the SP's, the intercepts and draw curve.

Biggest power dominates

$$y = 8x^3 - 3x^4$$

As  $x \rightarrow \infty$   $-3x^4$  will dominate and so large  $x$ 's will be -ve

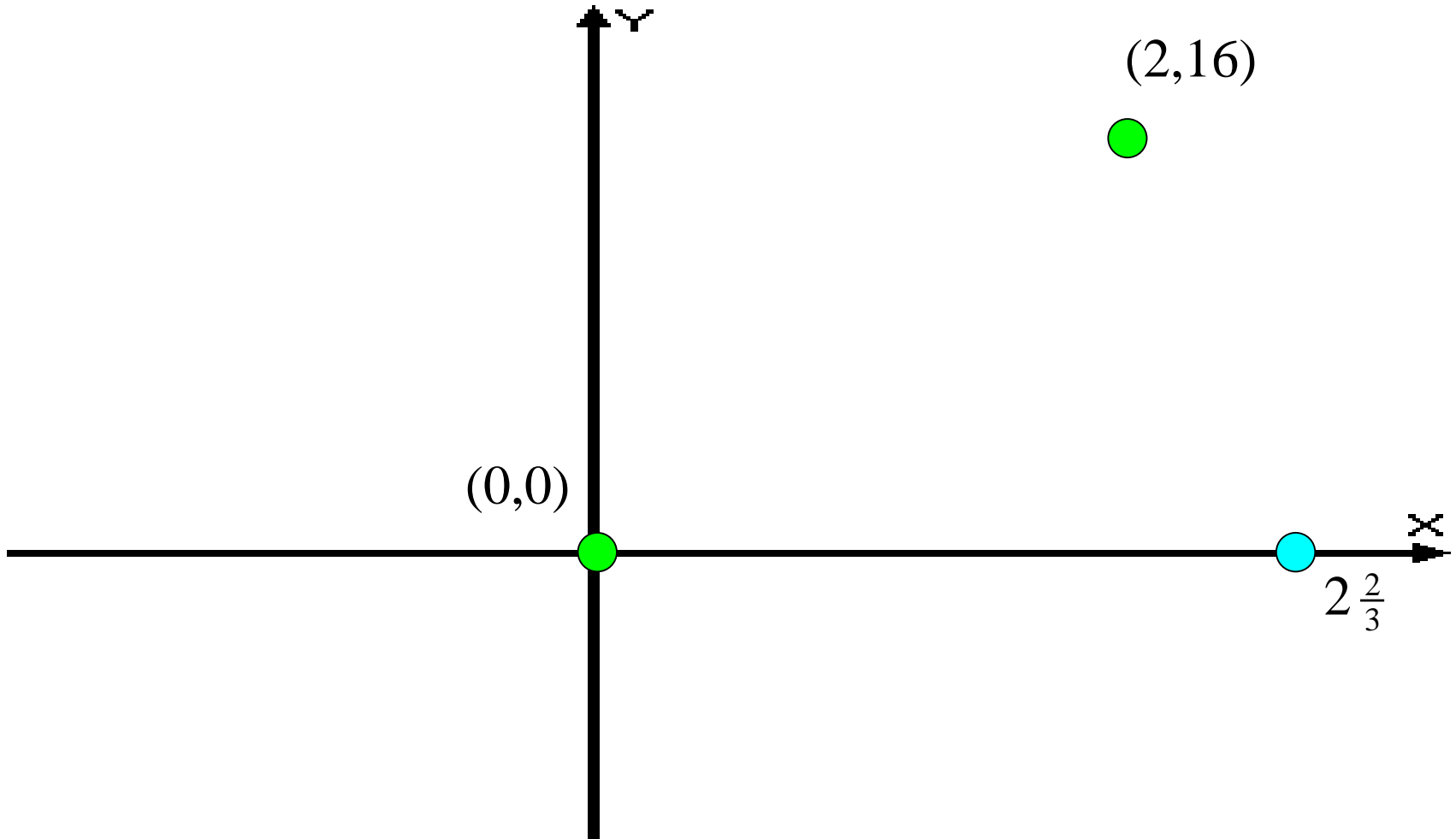
As  $x \rightarrow -\infty$   $-3x^4$  dominates and so small  $x$ 's will be -ve

Solution:

y-intercept is  $(0,0)$

x-intercepts  $(0,0)$  &  $(2\frac{2}{3},0)$

$(0,0)$  is a rising point of inflexion  $(2,16)$  is a maximum tp



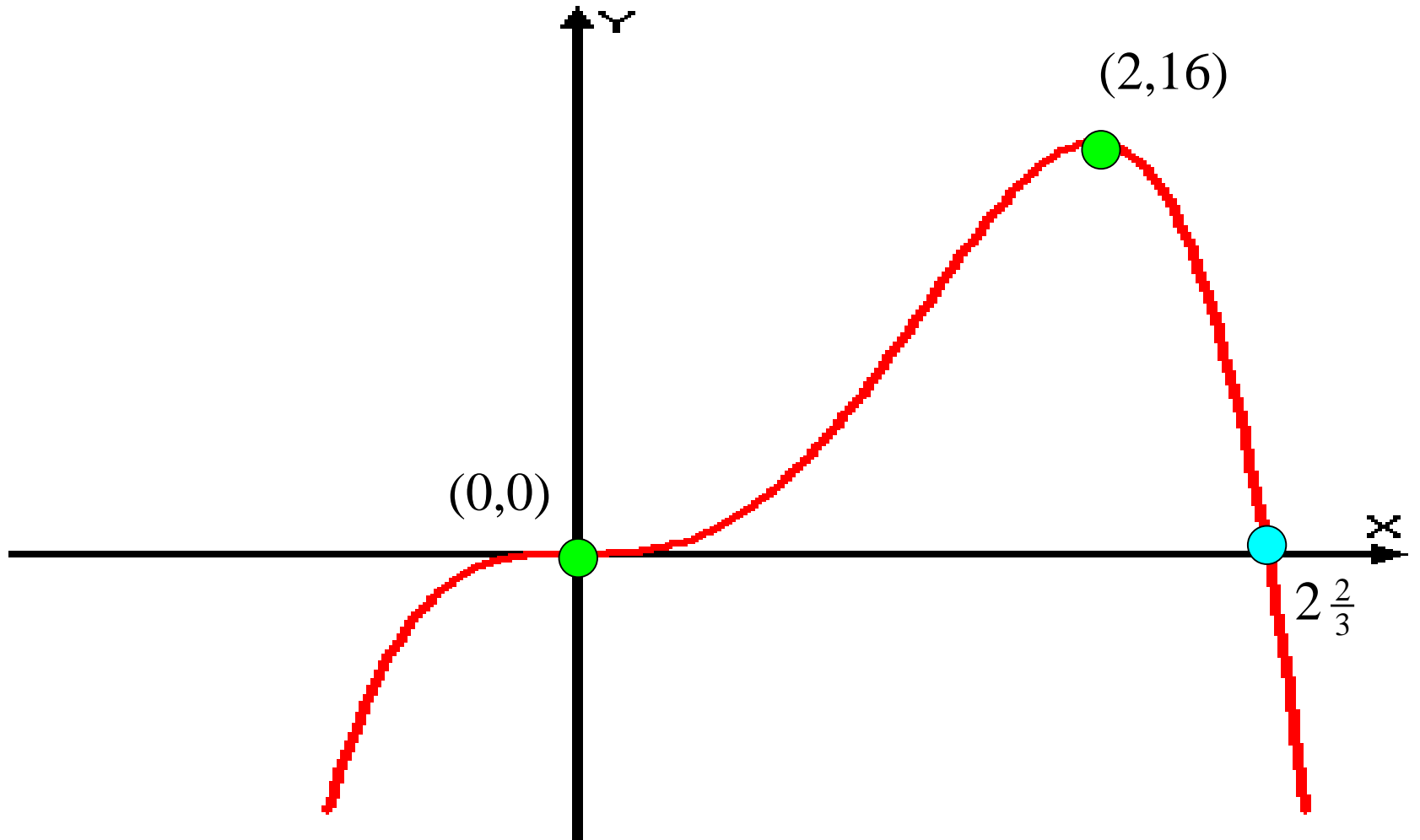


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$$y = 8x^3 - 3x^4$$

Heinemann , p.107, EX 6N  
Q1, 2, 5, 7 & 8