

Textbook: p.29 #14

$$f(x) = x^3 + 2x^2 - 5x - 6$$

(a) degree = 3, odd degree: opposite end behaviour

$a = 1 > 0$ , from QIII into QI

As  $x \rightarrow +\infty$ ,  $y \rightarrow +\infty$   
As  $x \rightarrow -\infty$ ,  $y \rightarrow -\infty$  } Actual end behaviour.

(b) Need zeroes:

$$\text{Let } f(x) = 0, \quad 0 = x^3 + 2x^2 - 5x - 6.$$

Let's hope there are integer solutions. If it is the

$$\text{case: } \quad 0 = x^3 + 2x^2 - 5x - 6$$

$$6 = x^3 + 2x^2 - 5x \text{ and we factor } x \text{ on Right Side}$$

$$6 = x(x^2 + 2x - 5)$$

Then  $x$  is a factor of 6. Let's list integer factors of 6:

$$\pm 1, \pm 2, \pm 3, \pm 6$$

Now we check those values:

$$f(-1) = 0 \text{ so } (x - (-1)) = (x + 1) \text{ is a linear factor of } f(x)$$

To every  $x$ -intercept,  $x = a$ , there corresponds a linear factor  $(x - a)$  of  $f(x)$ .

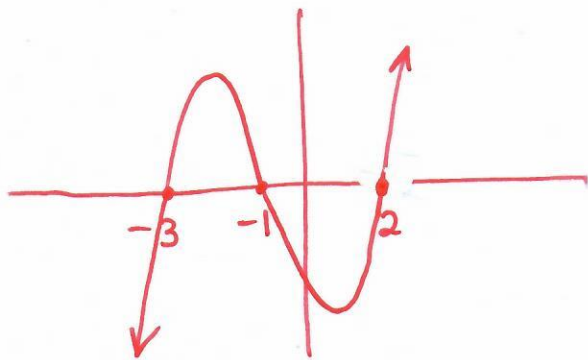
$$f(2) = 0 \text{ so } (x - 2) \text{ is a factor}$$

$$f(-3) = 0 \text{ so } (x + 3) \text{ is a factor}$$

$$f(x) = a(x - b)(x - c)(x - d)$$

$$f(x) = (x + 1)(x - 2)(x + 3) \leftarrow \text{each zero is of order 1,}$$

So the graph crosses (and looks linear "for a moment")  
at  $x = -3$ ,  $x = -1$ ,  $x = 2$



Good idea:

check on each interval

(a) pick  $x < -3$ , say  $x = -4$ ,  $y < 0$

(b) pick  $-3 < x < -1$ , say  $x = -2$ ,  $y > 0$

(c) pick  $-1 < x < 2$ , say  $x = 0$ ,  $y < 0$

(d) pick  $x > 2$ , say  $x = 3$ ,  $y > 0$