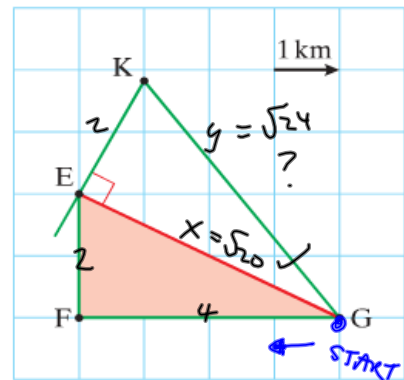


Martin starts at G and walks along a path towards a point F. At F, he takes the perpendicular path to E. He then takes the path EK, which is the same length as [EF] and is at right angles to [EG]. From K, he returns directly to G. Find exactly, in surd form, the distance travelled by Martin.



$$8 + \sqrt{24}$$

$$8 + 2\sqrt{6} \checkmark$$

$$X^2 = 2^2 + 4^2$$

$$X^2 = 20$$

$$X = \sqrt{20}$$

$$y^2 = 2^2 + \sqrt{20}^2 = 24$$

$$y = \sqrt{24}$$

Section 2.9 The factor theorem

Example 1

Show that $(2x - 3)$ is a factor of $2x^3 - 5x^2 + 5x - 3$.

Factor $\Rightarrow 2x - 3$

$$2x - 3 = 0$$

$$2x = 3$$

$$x = 3/2$$

COULD DIVIDE

$$2\left(\frac{3}{2}\right)^3 - 5\left(\frac{3}{2}\right)^2 + 5\left(\frac{3}{2}\right) - 3$$

$$= 0 \quad \checkmark$$

Aside

notes! FACTOR THRM

If k is a root

the $(x - k)$ is a factor

Also if k is solution/root

$$f(k) = 0$$

method:

① FIND ROOT

② SUB IN and show $f(k) = 0$

Example 2

If $(x - 2)$ and $(x + 1)$ are both factors of $ax^3 + 3x^2 - 9x + b$, find the values a and b .

$$f(2) = 0$$

$$a(2)^3 + 3(2)^2 - 9(2) + b = 0$$

$$8a + 12 - 18 + b = 0$$

$$8a + b = 6$$

$$\begin{array}{r} 8a + b = 6 \\ + a - b = 12 \\ \hline 9a = 18 \\ a = 2 \end{array}$$

$$f(-1) = 0$$

$$a(-1)^3 + 3(-1)^2 - 9(-1) + b = 0$$

$$-a + 3 + 9 + b = 0$$

$$-a + b = -12$$

$$\begin{array}{r} b = a - 12 \\ b = 2 - 12 \\ b = -10 \end{array}$$

Aside

- ① Find Related Roots
- ② Sub in $f(x) = 0$
- ③ Solve 2 Sim. Equation

Example 3

Factorise $f(x) = 2x^3 + x^2 - 13x + 6$.

$$\textcircled{1} f(2) = 2(2)^3 + (2)^2 - 13(2) + 6$$

$$= 16 + 4 - 26 + 6 = 0$$

$$\Rightarrow (x - 2) \text{ is factor}$$

$$\textcircled{2} \begin{array}{r} 2x^2 + 5x - 3 \\ x-2 \overline{) 2x^3 + x^2 - 13x + 6} \\ \underline{+ 2x^3 + 4x^2} \\ 5x^2 - 13x \\ \underline{+ 5x^2 + 10x} \\ -3x + 6 \\ \underline{+ 3x + 6} \\ 0 \end{array}$$

$$\textcircled{3} 2x^2 + 5x - 3$$

$$(2x - 1)(x + 3)$$

$$\textcircled{4} f(x) = (x - 2)(x + 3)(2x - 1)$$

Aside

* note: this question wants factors not solutions

- ① Guess to find 1st Root
- ② Divide by factor
- ③ Factorise quadratic
- ④ Write out factors