4D

16) Rational root theorem if $P\left(-\frac{b}{a}\right)=0$

then $(ax+b)$ is a factor

so for $12x^3+20x^2-x-6$,

lets try $P\left(-\frac{2}{3}\right)$

now $P\left(-2/3\right) = 12\left(-\frac{2}{3}\right)^3 + 20\left(\frac{2}{3}\right)^2 - \left(-\frac{2}{3}\right) - 6$

$= 12\left(-\frac{8}{27}\right) + 20\left(\frac{4}{9}\right) + \frac{2}{3} - 6$

$= -\frac{32}{9} + \frac{80}{9} + \frac{6}{9} - \frac{54}{9}$

$= 0$

now as $P\left(-\frac{2}{3}\right)=0$, then $(3x+2)$ is a factor

$\downarrow$

now, dividing $12x^3+20x^2-x-6 \div 3x+2$

$= 4x^2+4x-3$

now factorise this

$\rightarrow 4x^2-2x+6x-3$

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

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

$\therefore 12x^3+20x^2-x-6 = (2x+3)(2x-1)(3x+2)$