Subject/Topic: A Maths P2 2018 Date:

7(iii) Time taken to reach B is given by

$\frac{21}{2}e^{-t/80} - 2 = 1.5$

$\frac{21}{2}e^{-t/80} = 3.5$

$= \frac{7}{2}$

$e^{-t/80} = \frac{1}{3}$

$\ln e^{-t/80} = \ln \frac{1}{3}$

$(-\frac{t}{80}) \ln e = \ln \frac{1}{3}$

$-\frac{t}{80}(1) = \ln \frac{1}{3}$

$t = -80 \ln \frac{1}{3}$

$= 87.88898309$

≈ 87.9 s

Distance from A at this instance

$= 840\left(1 - e^{-87.9/80}\right) - 2(87.9)$

$= 384.2220338$

≈ 384 m

Distance she has to push bicycle

$= 500 - 384$

$= 116$ m

(ii) $P\left(\frac{3}{2}\right) = 2\left(\frac{3}{2}\right)^3 + 5\left(\frac{3}{2}\right)^2 - 18$

$= \frac{27}{4} + \frac{45}{4} - 18$

$= 0$ (i.e. no remainder)

Therefore, $(2x-3)$ is a factor of $p(x)$.

(iii) By factorisation, $2x^3 + 5x^2 - 18 = (2x-3)(ax^2+bx+c)$

$= (2x-3)(x^2+bx+6)$

$= (2x-3)(x^2+4x+6)$

$p(x) = 0$

$2x^3 + 5x^2 - 18 = 0$

$(2x-3)(x^2+4x+6) = 0$

For the solutions given by $x^2+4x+6=0$,

$b^2 - 4ac = 4^2 - 4(1)(6)$

$= -8 < 0$

So, $x^2+4x+6=0$ has no real root.

Therefore, $p(x)$ has only one real root $x = \frac{3}{2}$.

8(i) $P(x) = 2x^3 + 5x^2 - 18$

$P(-2) = 2(-2)^3 + 5(-2)^2 - 18$

$= -16 + 20 - 18$

$= -14$