

Activity 3 WTP(1)

Activity 3

Here are two student responses to question 5 June 2019 Pure 1.

Use the attached mark scheme to mark the responses. The question is also there.

Please note that:

M marks are for correct method

dM1 means the mark cannot be awarded unless the previous M mark was awarded.

An A mark can only be awarded if the corresponding M mark has.

A

a) $2x^3 + 3x^2 - 35x = 0$
 $x(2x^2 + 3x - 35) = 0$

$x = 0$, $2x^2 + 3x - 35 = 0$
 $x = \frac{7}{2}$, $x = -5$

Real solutions of $2x^3 + 3x^2 - 35x = 0$
 $x = \frac{7}{2}$, $x = -5$

b) $2(y-5)^6 + 3(y-5)^4 - 35(y-5)^2$
 Let $(y-5)^2$ be x

$2x^3 + 3x^2 - 35x = 0$
 $x(2x^2 + 3x - 35) = 0$

$x = 0$, $2x^3 + 3x - 35 = 0$
 $x = \frac{7}{2}$, $x = -5$

$(y-5)^2 = \frac{7}{2}$ $(y-5)^2 = -5$
 $y-5 = \pm\sqrt{\frac{7}{2}}$ $y-5 = \pm\sqrt{5}$
 $y = 5 \pm \sqrt{\frac{7}{2}}$ $y = 5 \pm \sqrt{5}$



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B

a

$$2x^3 + 3x^2 - 35x = 0$$
$$x(2x^2 + 3x - 35) = 0$$
$$x(x+5)(2x-7) = 0$$
$$x = 0 \text{ or } x = -5 \text{ or } x = \frac{7}{2}$$

b) $2(y-5)^6 + 3(y-5)^4 - 3(y-5)^2 = 0$

Let $x = (y-5)^2$

$$2x^3 + 3x^2 - 35x = 0$$
$$(y-5)^2 = 0 \rightarrow y = 5$$
$$(y-5)^2 = -5 \rightarrow \text{impossible}$$
$$(y-5)^2 = \frac{7}{2}$$

↓

$$y-5 = \pm \sqrt{\frac{7}{2}} \quad y = \pm \sqrt{\frac{7}{2}} + 5 \quad \therefore y = \pm \frac{\sqrt{14}}{2} + 5$$



Pearson

Activity 3 WTP(1)

5. (a) Find, using algebra, all real solutions of

$$2x^3 + 3x^2 - 35x = 0 \quad (3)$$

- (b) Hence find all real solutions of

$$2(y-5)^6 + 3(y-5)^4 - 35(y-5)^2 = 0 \quad (4)$$

Question Number	Scheme	Marks
5.(a)	$2x^3 + 3x^2 - 35x = 0 \Rightarrow x(2x^2 + 3x - 35) = 0$ $(2x-7)(x+5) = 0 \Rightarrow x = \dots$ $x = -5, 0, \frac{7}{2}$	M1 dM1 A1 (3)
(b)	$2(y-5)^6 + 3(y-5)^4 - 35(y-5)^2 = 0$ States that $y = 5$ is a solution $(y-5)^2 = \frac{7}{2} \Rightarrow y = \dots$ $y = 5 + \sqrt{\frac{7}{2}}$ or $y = 5 - \sqrt{\frac{7}{2}}$ or exact equivalent Both $y = 5 + \sqrt{\frac{7}{2}}$ and $y = 5 - \sqrt{\frac{7}{2}}$ or exact equivalent.	B1 M1 A1ft A1 (4) (7 marks)

(a)

M1 Takes out a common factor of x . Score if each term is divided by x .

dM1 Attempts to solve the resulting quadratic **via algebra** (usual rules). Allow factorisation, formula or completion of square. They cannot just write down answers from their calculator for this mark.

A1 $x = -5, 0, \frac{7}{2}$

Note 1: Some candidates will just write down their answers from a calculator. This scores 0,0,0

Note 2: Some students will attempt to solve the cubic by the quadratic formula Eg.

$$2x^3 + 3x^2 - 35x = 0 \Rightarrow a = 2, b = 3, c = -35 \text{ and use } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \Rightarrow x = -5, \frac{7}{2}$$

This scores 0,0,0 as the method used is incorrect

(b)

B1 States that 5 is a solution of the given equation in (b)

M1 Realises that $x = (y-5)^2$ and proceeds to find a value for y using $(y-5)^2 = \frac{7}{2} \Rightarrow y = \dots$ Follow through on any positive value from (a). Allow decimal answers here. Don't be overly concerned by the mechanics of their solution.

A1ft A solution of $5 + \sqrt{\frac{7}{2}}$ or $5 - \sqrt{\frac{7}{2}}$ You should follow through on their positive root.
Allow decimals for this mark only. So accept awrt 6.87 or awrt 3.13

A1 Both $5 + \sqrt{\frac{7}{2}}$ and $5 - \sqrt{\frac{7}{2}}$ with no other solutions for part (b) apart from 5. Do not allow decimal equivalents. Don't allow complex solutions.