| Question | Scheme | Marks |
|---|---|---|
| 8(a) | $x$ \| 1 \| 2 \| 3 \| 4 \| 5<br>f($x$) \| 0.5 \| **−1.2401** \| −0.2885 \| **0.1508** \| 0.5840<br>One correct<br>Both correct | **B1**<br>**B1** |
| | | **(2)** |
| **(b)** | Identify an interval where the sig changes and mention the change of sign | **M1** |
| | f is continuous on [3,4], not on [1,2] hence the root is in [3,4] | **A1** |
| | | **(2)** |
| **(c)** | $f(3.5) = -0.064... < 0$ so root in [3.5,4] | **M1** |
| | $f(3.75) = 0.0435... > 0$ | **M1** |
| | Hence root is in the interval [3.5, 3.75] | **A1** |
| | | **(3)** |
| **(d)** | E.g. $\frac{f(-0.5)-f(-1)}{-0.5-(-1)} = \frac{f(-0.5)-0}{-0.5-\beta}$ or $\frac{\beta-(-1)}{0-f(-1)} = \frac{\beta-(-0.5)}{0-f(-0.5)}$ etc | **M1** |
| | $\Rightarrow \beta = -0.5 - \frac{0.5\times f(-0.5)}{f(-0.5)-f(-1)} = ...$ or $\beta = \frac{-0.5f(-1)+f(-0.5)}{(f(-1)-f(-0.5))} = ...$ etc | **dM1** |
| | $= -0.5 - \frac{0.5\times 0.5786...}{0.5786...-(-0.875)} = -0.6990... = -0.699$ (awrt) | **A1** |
| | | **(3)** |
| | | **(10 marks)** |

**Notes:**

**Accept open or closed intervals throughout the question where relevant and intervals described by inequalities.**

**(a)**

**B1:** One correct value of the two missing.

**B1:** Both values correct.

**(b)**

**M1:** Identifies at least one of the intervals on which a sign change occurs – must mention sign changing.

**A1:** Correct interval with reason given. Accept reasons such as f not defined at $\frac{5}{3}$ in [1,2] or $x = \frac{5}{3}$ is an asymptote as reason for dismissing this interval.

**(c)**

**M1:** Evaluates f at the midpoint of their chosen interval from (b) and selects interval of length 0.5 in which the root lies. This mark can be awarded if the interval was incorrect (even if no change of sign in that interval)

**M1:** Evaluates f at the midpoint of their interval of length 0.5, and considers the signs or chooses the "correct" interval of length 0.25. There must have been a change of sign in their initial interval for this mark to be awarded.

**A1:** Correct interval selected with all values correct to at least 1 s.f. rounded or truncated. No extra intervals included.

**(d)**

**M1:** Correct interpolation strategy. Accept any correct statement such as the one shown. Sign errors imply an incorrect formula unless they follow a correct general statement.

**dM1:** Rearranges to find $\beta$ and evaluates.

**A1:** Accept awrt $-0.699$ following correct working.