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CID:

### Tutorial 6

Any marks received for the tutorial are only indicative and may be subject to moderation and scaling.

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<b>Exercise 1 (Convergence)</b>	<b>% of CW mark: 1.0</b>
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Which of the methods (Euler's method, Trapezoidal rule, AB(2)) is divergent?

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<b>Exercise 2 (Consistency)</b>	<b>% of CW mark: 1.5</b>
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The first characteristic polynomial of the general Backward Differentiation Formula of order  $k$

$$x_{n+k} + \alpha_{k-1}x_{n+k-1} + \alpha_{k-2}x_{n+k-2} + \dots + \alpha_0x_n = h\beta_k f_{n+k}$$

is given by

$$\rho(r) = \left( \sum_{j=1}^k \frac{1}{j} \right)^{-1} \sum_{j=1}^k \frac{r^{k-j}(r-1)^j}{j}.$$

Use consistency of the method to calculate  $\beta_4$ .

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<b>Exercise 3 (Convergence)</b>	<b>% of CW mark: 2.0</b>
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**Mastery Component**

Study how the convergence of the method

$$x_{n+2} - x_{n+i} = \frac{h}{3} (f_{n+2} + 4f_{n+1} + f_n)$$

depends on  $i = \{0, 1\}$ .