7. Assignment 7

Due Wednesday, March 21

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(1) Determine the order and the region of absolute stability of s-step Adams-Bashforth methods for $s=2,3$,

$$
\begin{aligned}
s=2: \quad y_{n+2} = & \quad y_{n+1}+h\left[\frac{3}{2} f\left(t_{n+1}, y_{n+1}\right)-\frac{1}{2} f\left(t_n, y_n\right)\right] \\
s=3: \quad y_{n+3} = & \quad y_{n+2}+h\left[\frac{23}{12} f\left(t_{n+2}, y_{n+2}\right)-\frac{4}{3} f\left(t_{n+1}, y_{n+1}\right)+\frac{5}{12} f\left(t_n, y_n\right)\right]
\end{aligned}
$$

and the order and the region of absolute stability of the 2-step Adams-Moulton method,

$$
s=2: \; y_{n+2}=y_{n+1}+h\left[\frac{5}{12} f\left(t_{n+2}, y_{n+2}\right)+\frac{2}{3} f\left(t_{n+1}, y_{n+1}\right)-\frac{1}{12} f\left(t_n, y_n\right)\right]
$$

(2) Determine the order and the region of absolute stability of Backward Differentiation Formulas (BDF) methods of orders $s=2,3$:

$$
\begin{aligned}
s=2: & \qquad y_{n+2}-\tfrac{4}{3} y_{n+1}+\tfrac{1}{3} y_n & = \frac{2}{3} h f\left(x_{n+2}, y_{n+2}\right) \\
s=3: & \quad y_{n+3}-\tfrac{18}{11} y_{n+2}+\tfrac{9}{11} y_{n+1}-\tfrac{2}{11} y_n & = \frac{6}{11} h f\left(x_{n+3}, y_{n+3}\right)
\end{aligned}
$$

In all problems describe (briefly) your approach and plot the regions.