

HW 7

D a) i, ii $f(x) = \frac{5}{2}x(1-x) = x$

$$\frac{5}{2}x - \frac{5}{2}x^2 = x$$

$$x=0, \frac{3}{5}$$

$$\frac{3}{5}x - x^2 = 0$$

$$x(\frac{3}{5} - x) = 0$$

$$f'(x) = \frac{5}{2} - 5x$$

$$\frac{5}{2} - 3 = -\frac{1}{2}$$

$$3/5 \text{ is}$$

STABLE

b) $f(x) = \frac{29}{10}x(1-x) = x$

$$\frac{29}{10}x - \frac{29}{10}x^2 = x$$

$$x=0, \frac{19}{29}$$

$$\frac{19}{29}x - x^2 = 0$$

$$x(\frac{19}{29} - x) = 0$$

$$f'(x) = \frac{29}{10} - \frac{29}{5}x$$

$$\frac{29}{10} - \frac{38}{10} = -\frac{9}{10}$$

$19/29$ IS STABLE

c) $f(x) = \frac{31}{10}x(1-x) = x$

$$\frac{31}{10}x - \frac{31}{10}x^2 = x$$

$$x=0, \frac{21}{31}$$

$$\frac{21}{31}x - x^2 = 0$$

$$f'(x) = \frac{31}{10} - \frac{31}{5}x$$

$$\frac{31}{10} - \frac{42}{10} = -\frac{11}{10}$$

NEITHER
ARE STABLE

HW 7 ORB(F(x), x, x_I , 0, 10)

$x_I = 0.5$

a) $[0.5, 0.625, 0.588, 0.606, 0.599, 0.602, 0.599, 0.600, 0.599, 0.6]$

$x_I = -0.1$

(ii) $[-0.1, -0.275, -0.676, -4.11, -52.5, -7037, \dots]$

b) $x_I = -0.1, [-0.1, -0.319, -1.22, -7.85, -701.78, -118660, \dots]$

$x_I = \frac{12}{30}, [0.633, 0.67, 0.637, 0.669, 0.64122, 0.667, 0.6435, 0.665, 0.646, 0.663, 0.644]$

c) $x_I = -0.1, [-0.1, -0.34, -1.42, -10.6, -712.83, -45558, \dots]$

$x_I = \frac{20}{31}, [0.645, 0.709, 0.6387, 0.715548, 0.6312, \dots]$

ORB(F(x), x, x_I , 0, 10)

a) $x_I = 1.9, [1.9, 1.92, 1.94, 1.95, 1.96, 1.97, 1.98, 1.99, 1.99, 1.99]$

$0.454, 0.57, -1.12, 0.54, \dots]$ MAY 2

b) $x_I = 1.9, [1.9, 1.92, 1.94, 1.95, 1.96, 1.97, 1.98, 1.99, 1.99, 1.99]$

iii) $x_I = 2.9, [2.9, 2.97, 2.92, 2.977, 2.93, \dots]$

b) $x_I = 1.9, [1.9, 1.95, 1.79, 1.69, 1.52, 1.22, 0.576, -1.32, -12.66, -521, -1.2 \cdot 10^7]$

$x_I = 2.9, [2.9, 2.92, 2.94, 2.96, 2.97, 2.97, 2.98, 2.99, 2.99, 2.99]$

$x_I = 4.9, [4.9, 4.93, 4.72, 4.56, 4.34, 4.08, 3.82, 3.6, 3.43, 3.31, 3.23]$

2) a) $x(n+1) = \frac{1}{5}x^3 - \frac{6}{5}x^2 + \frac{16}{5}x - \frac{6}{5}$ $f(x) = \frac{3}{5}x^2 - \frac{12}{5}x + \frac{16}{5}$

$f'(1) = \frac{7}{5}$

$x=1, \frac{1}{5} - \frac{6}{5} + \frac{16}{5} - \frac{6}{5} = \frac{17-12}{5} = 1$ ✓

$f(2) = \frac{12}{5} - \frac{24}{5} + \frac{16}{5} = \frac{4}{5}$

$f'(3) = \frac{12}{5} - \frac{36}{5} + \frac{16}{5} = \frac{2}{5}$

$x=2, \frac{1}{5}(8) - \frac{6}{5}(4) + \frac{16}{5}(2) - \frac{6}{5} = \frac{8}{5} - \frac{24}{5} + \frac{32}{5} - \frac{6}{5}$

$\frac{32-24+8}{5} = \frac{16}{5}$ ✓

$x=3, \frac{1}{5}(27) - \frac{6}{5}(9) + \frac{16}{5}(3) - \frac{6}{5} = \frac{27}{5} - \frac{54}{5} + \frac{48}{5} - \frac{6}{5} = \frac{15}{5}$ ✓

b) $x(n+1) = \frac{1}{8}x^3 - \frac{5}{4}x^2 + \frac{39}{8}x - \frac{15}{4}$

$x=2, \frac{1}{8} - \frac{5}{2} + \frac{39}{4} - \frac{15}{4} = \frac{16}{8}$ ✓

$x=3, \frac{27}{8} - \frac{45}{4} + \frac{117}{8} - \frac{30}{8} = \frac{24}{8}$ ✓

$x=5, \frac{125}{8} - \frac{125}{4} + \frac{195}{8} - \frac{30}{8} = \frac{40}{8}$ ✓

$f'(x) = \frac{3}{8}x^2 - \frac{20}{8}x + \frac{39}{8}$

$f'(2) = \frac{12}{8} - \frac{40}{8} + \frac{39}{8} = \frac{11}{8}$

$f'(3) = \frac{27}{8} - \frac{60}{8} + \frac{39}{8} = \frac{6}{8}$

$f'(5) = \frac{75}{8} - \frac{100}{8} + \frac{39}{8} = \frac{14}{8}$

x=3 is STABLE