

1 a

$$f(x) = \frac{5}{2} x (1-x)$$

$$x = \frac{5}{2} x (1-x)$$

$$x=0$$

$$1 = \frac{5}{2} (1-x)$$

$$x \neq 0$$

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

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

$$SS: \frac{3}{5}, 0$$

$$f'(x) = \frac{5}{2} (1-2x)$$

$$f'(0) = \frac{5}{2} > 1, \text{ unstable}$$

$$f'(\frac{3}{5}) = \frac{5}{2} (1-\frac{6}{5}) = -\frac{1}{2}$$

$$\frac{5}{2} (-\frac{1}{2}) = -\frac{1}{2}, |-\frac{1}{2}| < 1, \text{ stable}$$

$$0.600096$$

b $Orb(f, x, 0.1, 5, 10) = [0.6038, 0.598, 0.5995, 0.6002, 0.59997, 0.60002, 0.599925, 0.60000378, 0.5999961215]$
shows how unstable 0 is and how stable $\frac{3}{5}$ is

$$Orb(f, x, 0.8, 1, 11) = [0.4, 0.6, 0.6, 0.6, 0.6, 0.6, 0.6, 0.6, 0.6, 0.6, 0.6]$$

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

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

$$x=0$$

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

$$x \neq 0$$

$$f'(x) = \frac{29}{10} (1-2x)$$

$$f'(0) = \frac{29}{10} > 1 \text{ unstable}$$

$$f'(\frac{19}{29}) = \frac{29}{10} (1 - \frac{38}{29})$$

$$\frac{10}{29} = 1-x$$

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

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

$Orb(f, x, 0.1, 2, 13) =$

$$[0.55934, 0.714785, 0.59122, 0.70087, 0.60799, 0.69118, 0.619003, 0.68393, 0.6269, 0.6783, 0.6328, 0.67386]$$

$Orb(f, x, evalP(\frac{20}{29}), 2, 13) = [0.68275, 0.62814, 0.67738, 0.67312, 0.63809, 0.66970, 0.64148, 0.66694, 0.64418, 0.66471, 0.64632]$

2 a

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

$$x = \frac{1}{3}x^3 - \frac{6}{5}x^2 + \frac{16}{5}x - \frac{6}{5}$$

$$0 = \frac{1}{3}x^3 - \frac{6}{5}x^2 + \frac{11}{5}x - \frac{6}{5}$$

$$\text{let } x=1$$

$$0 = \frac{1}{3} - \frac{6}{5} + \frac{11}{5} - \frac{6}{5}$$

$$\frac{3}{15} - \frac{18}{15} + \frac{33}{15} - \frac{18}{15} = 0$$

$$\text{let } x=2$$

$$\frac{8}{3} - \frac{24}{5} + \frac{22}{5} - \frac{6}{5}$$

$$30 - 6 - 24 = 0$$

$$\text{let } x=3$$

$$\frac{27}{3} - \frac{54}{5} + \frac{33}{5} - \frac{6}{5}$$

$$27 + 33 - 54 - 6 = 6$$

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

$$f'(1) = \frac{3}{5} - \frac{12}{5} + \frac{16}{5} = \frac{7}{5} > 1, \text{ unstable}$$

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

$$f'(3) = \frac{27}{5} - \frac{36}{5} + \frac{16}{5} = \frac{7}{5}, \text{ unstable}$$

$$\text{Orb}(f, x, 0.9, 1, 11) = [0.8538, 0.7819, 0.6641, 0.4544, 0.0251, -1.1204, -6.573, -130.87, -469259, -2.066 \times 10^{10}, -1.7652 \times 10^{18}]$$

$$\text{Orb}(f, x, 2.3, 1, 11) = [2.2454, 2.1993, 2.1296, 2.1041, 2.0836, 2.0669, 2.0536, 2.0428, 2.0343, 2.0274]$$

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

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

$$0 = \frac{1}{8}x^3 - \frac{5}{4}x^2 + \frac{39}{8}x - \frac{15}{4}$$

$$\text{let } x=2$$

$$\frac{1}{8} \cdot 8 - \frac{5}{4} \cdot 4 + \frac{62}{8} - \frac{30}{4}$$

$$1 - 5 + \frac{32}{8} = 0$$

$$\text{let } x=3$$

$$\frac{27}{8} - \frac{90}{8} + \frac{93}{8} - \frac{36}{8} = 0$$

$$\text{let } x=5$$

$$\frac{125}{8} - \frac{125}{4} + \frac{155}{8} - \frac{30}{8}$$

$$1 - \frac{5125}{8} + \frac{155}{8} - \frac{30}{8} = 0$$

$$f'(x) = \frac{3}{8}x^2 - \frac{5}{2}x + \frac{39}{8}$$

$$f'(2) = \frac{12}{8} - 5 + \frac{39}{8} = \frac{9}{8} - \frac{40}{8} = \frac{1}{8} > 1 \text{ unstable}$$

$$f'(3) = \frac{27}{8} - \frac{15}{2} + \frac{39}{8} = \frac{27}{8} - \frac{60}{8} + \frac{39}{8} = \frac{3}{8}, \text{ stable}$$

$$f'(5) = \frac{75}{8} - \frac{100}{8} + \frac{39}{8} = \frac{14}{8} > 1, \text{ unstable}$$

$$\text{Orb}(f, x, 1.9, 2, 13) = [1.7934, 1.6934, 1.5278, 1.2260, 0.5782, -1.325, \\ -12.695, -552.84, -1.8 \times 10^7, -7.5 \times 10^{20}, -5.4 \times 10^{61}, -1.9 \times 10^{184}]$$

$$\text{Orb}(f, x, 2.9, 2, 13) = [2.9419, 2.9566, 2.9745, 2.9806, \\ 2.9850, 2.9886, 2.9906, 2.9924, 2.9944, 2.9961, 2.9969]$$

$$\text{Orb}(f, x, 5.1, 2, 13) = [5.337, 5.665, 6.477, 9.35, 34.731, \\ 3894.6, 7.1 \times 10^9, 5 \times 10^{28}, 1.56 \times 10^{85}, 4.72 \times 10^{254}, 1.3 \times 10^{783}, \\ 2.8 \times 10^{2284}]$$