

6.1 Euler's Method #74-77, #79-82 all
p.405

(5 steps only: $n=5$)

74) $y' = x + y$ $y(0) = 2$ $n=5$, $h=0.05$ or $\Delta x = 0.05$

x	y	$m = dy/dx$	$\Delta y = m(\Delta x)$	$y_{new} = y + \Delta y$
0	2	$0+2 = 2$	$2(0.05) = 0.1$	$2+0.1 = 2.1$
0.05	2.1	2.15	$2.15(0.05) = 0.1075$	$2.1+0.1075 = 2.208$
0.10	2.208	2.308	$2.308(0.05) = 0.1154$	$2.208+0.1154 = 2.323$
0.15	2.323	2.4734	$2.4734(0.05) = 0.12367$	$0.12367+2.323 = 2.447$
0.20	2.447	2.647	$2.647(0.05) = 0.1324$	$0.1324 + 2.447 = 2.579$
0.25	<u>2.579</u>			

75) $y' = 3x - 2y$ $y(0) = 3$ $n=5$ $h=0.05$ ($\Delta x = 0.05$)

x	y	$m = dy/dx$	$\Delta y = m(\Delta x)$	$y_{new} = y + \Delta y$
0	3	-6	$-6(0.05) = -0.3$	$3-0.3 = 2.7$
0.05	2.7	-5.25	$-5.25(0.05) = -0.2625$	$2.7-0.2625 = 2.438$
0.10	2.438	-4.576	$-4.576(0.05) = -0.2288$	$2.438-0.2288 = 2.209$
0.15	2.209	-3.968	$-3.968(0.05) = -0.1984$	$2.209-0.1984 = 2.010$
0.20	2.010	-3.42	$-3.42(0.05) = -0.171$	$2.010-0.171 = 1.839$
0.25	<u>1.839</u>			

76) $y' = 0.5x(3-y)$ $y(0) = 1$ $n = 5$ $h = 0.4$ ($\Delta x = 0.4$)

x	y	$m = dy/dx$	$\Delta y = m \Delta x$	$y_{\text{new}} = y + \Delta y$
0	1	0	$0(0.4) = 0$	$1 + 0 = 1$
0.4	1	0.4	$0.4(0.4) = 0.16$	$1 + 0.16 = 1.16$
0.8	1.16	0.736	$0.736(0.4) = 0.2944$	$1.16 + 0.2944 = 1.454$
1.2	1.454	0.9276	$0.9276(0.4) = 0.371$	$1.454 + 0.371 = 1.825$
1.6	1.825	0.94	$0.94(0.4) = 0.376$	$0.376 + 1.825 = \underline{\underline{2.201}}$
2.0	2.201			

77) $y' = e^{xy}$ $y(0) = 1$ $n = 10$ $h = 0.1$ ($\Delta x = 0.1$)

x	y	$m = dy/dx$	$\Delta y = m \Delta x$	$y_{\text{new}} = y + \Delta y$
0	1	1	$1(0.1) = 0.1$	$1 + 0.1 = 1.1$
0.1	1.1	1.116	$1.116(0.1) = 0.112$	$0.112 + 1.1 = 1.212$
0.2	1.212	1.274	$1.274(0.1) = 0.127$	$0.127 + 1.212 = 1.339$
0.3	1.339	1.494	$1.494(0.1) = 0.149$	$0.149 + 1.339 = 1.488$
0.4	1.488	1.813	$1.813(0.1) = 0.181$	$0.181 + 1.488 = 1.669$
0.5	1.670			

$$\frac{dy}{dx} = \frac{2x}{y} \quad y = \sqrt{2x^2 + 4} \quad (0, 2)$$

80)

x	0	0.2	0.4	0.6	0.8	1
exact $y(x)$	2	2.0199	2.0785	2.1726	2.2978	2.4495
$h=0.2$	2	2.000	2.04	2.1184	2.2317	2.3751
$h=0.1$	2	2.01	2.0595	2.146	2.2655	2.4131

82) As h increases, the error increases

