Key

7.4 AP Practice Problems (p. 559) – Euler's Method

1. Suppose $y = f(x)$ is the solution of the differential equation $\frac{dy}{dx} = x + 2y$ with the initial condition $y(0) = 1$. Approximate $f(0.3)$ using Euler's method with $(x_0, y_0) = (0, 1)$ and using $h = 0.1$ as the increment.

(A) 1.20 **(B) 1.76** (C) 2.03 (D) 2.78

"$y = mx + b$"

$\Delta x = 0.1$ $\quad dy/dx = x + 2y$

x	y	y' or dy/dx	$y_n = y_{n-1} + y'(\Delta x)$
0	1	2	$1 + 2(0.1) = 1.2$
0.1	1.2	2.5	$1.2 + 2.5(0.1) = 1.45$
0.2	1.45	$0.2 + 2(1.45) = 3.1$	$1.45 + 3.1(0.1) = 1.76$
0.3	**1.76**		

2. Suppose $y = f(x)$ is the solution to the differential equation $\frac{dy}{dx} = 3x - 2y$ with the boundary condition $f(1) = 5$. What is the approximation for $f(1.2)$ using Euler's method starting at $x = 1$ and using two steps of equal size? **3.77** ✓

$\Delta x = \frac{b-a}{n} \rightarrow \frac{1.2 - 1}{2} = \frac{0.2}{2} = 0.1$

x	y	y' or $dy/dx = 3x - 2y$	$y_{new} = y + y'\Delta x$
1	5	$y' = 3(1) - 2(5) = -7$	$5 + (-7)(0.1) = 4.3$
1.1	4.3	$y' = 3(1.1) - 2(4.3) = -5.3$	$4.3 + (-5.3)(0.1) = 3.77$
1.2	**3.77**		