

# Multiple-Choice Test

## Chapter 08.02 Euler's Method

1. To solve the ordinary differential equation

$$3\frac{dy}{dx} + 5y^2 = \sin x, y(0) = 5$$

by Euler's method, you need to rewrite the equation as

- (A)  $\frac{dy}{dx} = \sin x - 5y^2, y(0) = 5$   
(B)  $\frac{dy}{dx} = \frac{1}{3}(\sin x - 5y^2), y(0) = 5$   
(C)  $\frac{dy}{dx} = \frac{1}{3}\left(-\cos x - \frac{5y^3}{3}\right), y(0) = 5$   
(D)  $\frac{dy}{dx} = \frac{1}{3}\sin x, y(0) = 5$

2. Given

$$3\frac{dy}{dx} + 5y^2 = \sin x, y(0.3) = 5$$

and using a step size of  $h = 0.3$ , the value of  $y(0.9)$  using Euler's method is most nearly

- (A)  $-35.318$   
(B)  $-36.458$   
(C)  $-658.91$   
(D)  $-669.05$

3. Given

$$3\frac{dy}{dx} + \sqrt{y} = e^{0.1x}, y(0.3) = 5$$

and using a step size of  $h = 0.3$ , the best estimate of  $\frac{dy}{dx}(0.9)$  using Euler's method is most nearly

- (A)  $-0.37319$   
(B)  $-0.36288$   
(C)  $-0.35381$   
(D)  $-0.34341$

4. The velocity (m/s) of a body is given as a function of time (seconds) by

$$v(t) = 200 \ln(1+t) - t, \quad t \geq 0$$

Using Euler's method with a step size of 5 seconds, the distance in meters traveled by the body from  $t = 2$  to  $t = 12$  seconds is most nearly

- (A) 3133.1  
 (B) 3939.7  
 (C) 5638.0  
 (D) 39397
5. Euler's method can be derived by using the first two terms of the Taylor series of writing the value of  $y_{i+1}$ , that is the value of  $y$  at  $x_{i+1}$ , in terms of  $y_i$  and all the derivatives of  $y$  at  $x_i$ . If  $h = x_{i+1} - x_i$ , the explicit expression for  $y_{i+1}$  if the first three terms of the Taylor series are chosen for the ordinary differential equation

$$2 \frac{dy}{dx} + 3y = e^{-5x}, \quad y(0) = 7$$

would be

- (A)  $y_{i+1} = y_i + \frac{1}{2}(e^{-5x_i} - 3y_i)h$   
 (B)  $y_{i+1} = y_i + \frac{1}{2}(e^{-5x_i} - 3y_i)h - \frac{1}{2}\left(\frac{5}{2}e^{-5x_i}\right)h^2$   
 (C)  $y_{i+1} = y_i + \frac{1}{2}(e^{-5x_i} - 3y_i)h + \frac{1}{2}\left(-\frac{13}{4}e^{-5x_i} + \frac{9}{4}y_i\right)h^2$   
 (D)  $y_{i+1} = y_i + \frac{1}{2}(e^{-5x_i} - 3y_i)h - \frac{3}{2}y_i h^2$
6. A homicide victim is found at 6:00 PM in an office building that is maintained at 72 °F. When the victim was found, his body temperature was at 85 °F. Three hours later at 9:00 PM, his body temperature was recorded at 78 °F. Assume the temperature of the body at the time of death is the normal human body temperature of 98.6 °F.

The governing equation for the temperature  $\theta$  of the body is

$$\frac{d\theta}{dt} = -k(\theta - \theta_a)$$

where,

$\theta$  = temperature of the body, °F

$\theta_a$  = ambient temperature, °F

$t$  = time, hours

$k$  = constant based on thermal properties of the body and air.

The estimated time of death most nearly is

- (A) 2:11 PM  
 (B) 3:13 PM  
 (C) 4:34 PM

(D) 5:12 PM

[Complete Solution](#)