Unit 14 - Week 12

Assignment 12

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-12-09, 23:59 IST.

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

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

Using Euler 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

1 point

- 3133.0
- 3939.7
- 5638.0
- 2543.6

No, the answer is incorrect.
Score: 0
Accepted Answers:
3133.0

2) Given

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

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

1 point

- -36.458
- -35.318
- -65.891
- None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of these

3) The solution to the IVP

$$y' = 1 + \frac{y}{t},\ 1 \leq t \leq 2,\ y(1) = 2,$$

is approximating using Euler's method with $h = 0.25$. Find a bounds for a approximation error at $t = 2$. The exact solution is $y(t) = t\log(t) + 2t$.

1 point

- 0.2148
- 1.2675
- 0.8732
- 1.5678

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.2148

4) Use Taylor method of order four to approximate the solution at $t = 0.4$ for the following IVP

$$y' = y - t^2 + 1,\ 0 \leq t \leq 2,\ y(0) = 0.5, \text{with } h = 0.2.$$

1 point

- 0.82
- 1.65
- 1.22
- 1.75

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.22

5) If Taylor's method of order n is used to approximate the solution to

$$y' = f(t, y(t)),\ a \leq t \leq b,\ y(a) = \alpha$$

with step size h and if $y \in C^{n+1}[a, b]$ then the local truncation error is

1 point

- $O(h^{n+1})$
- $O(h^{n-1})$
- $O(h^{n-2})$
- None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
$O(h^{n+1})$

6) A projectile of mass $m = 0.11kg$ shot vertically upward with initial velocity $v(0) = 8m/s$ is slowed due to the force of gravity $F_g = -mg$ and due to air resistance $F_r = -kv|v|$, where $g = 9.8m/s^2$. The differential equation for the velocity is given by

$$mv' = -mg - kv|v|.$$

If $v(0.1) = 6.9036$ using Euler's method with $h = 0.1$. Determine the value of k.

1 point

- $0.02\ gm/m$
- $0.01\ gm/m$
- $0.04\ gm/m$
- None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of these

For Q7-8: Consider the following IVP

$$y' = 1 + \frac{y}{t},\ 1 \leq t \leq 2,\ y(1) = 2.$$

7) Determine $y(1.5)$ using Modified Euler's method with $h = 0.25$.

1 point

- 3.6
- 4.5
- 4.75
- 2.5

No, the answer is incorrect.
Score: 0
Accepted Answers:
3.6

8) Determine $y(1.5)$ using Runge-kutta method of order four with $h = 0.25$.

1 point

- 2.77
- 4.47
- 5.38
- None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of these

For Q9-10: Given the initial value problem

$$y' = \frac{2}{t}y + t^2e^t,\ 1 \leq t \leq 2,\ y(1) = 0,$$

with exact solution $y(t) = t^2(e^t - e)$.

9) If we are using Taylor method of order two with $h = 0.1$ to approximate the solution. Determine the absolute error at $t = 1.5$

1 point

- 0.46253
- 0.02685
- 0.05668
- 0.00972

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.05668

10) If we are using Taylor method of order four with $h = 0.1$ to approximate the solution. Determine the absolute error at $t = 1.5$

1 point

- 0.01235
- 0.28457
- 0.01295
- None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of these