

7. Differential Equations

Starter Quiz · 课前小测

AP Calculus BC

Name: _____ Score: _____

1. A differential equation relates a function to its...

- ☐ inverse
- ☐ derivatives
- ☐ reciprocal
- ☐ domain

2. To verify a candidate solution, you...

- ☐ integrate both sides
- ☐ differentiate it and substitute into the equation
- ☐ plug in one value of x
- ☐ graph it

3. For $\frac{dy}{dx} = x + y$, find the slope of the dash at the point $(2, 3)$.

4. A solution curve through the slope field must always stay...

- ☐ perpendicular to the dashes
- ☐ tangent to the dashes
- ☐ horizontal
- ☐ a straight line

5. Euler's update rule is $y_{n+1} =$

- ☐ $y_n \cdot h f(x_n, y_n)$
- ☐ $y_n + h f(x_n, y_n)$
- ☐ $y_n + f(x_n, y_n)$
- ☐ $h f(x_n, y_n)$

6. Which equation is separable?

- ☐ $\frac{dy}{dx} = x + y$
- ☐ $\frac{dy}{dx} = xy$
- ☐ $\frac{dy}{dx} = x^2 + y^2$

☐ $\frac{dy}{dx} = \sin(x + y)$

7. $y = e^{3x}$ is a solution of $\frac{dy}{dx} = 3y$.

- ☐ True ☐ False

8. Two different solution curves of the same equation can cross each other.

- ☐ True ☐ False

9. For $\frac{dy}{dx} = x + y$, $y(0) = 1$, $h = 0.5$: the slope at $(0, 1)$ is 1. Find y_1 .

10. For $y = x^2 + C$ with $y(1) = 5$, find C .

AP Calculus BC

1. **derivatives**

It involves the function and its derivative(s).

2. **differentiate it and substitute into the equation**

Differentiate the candidate, substitute, check both sides match.

3. **5**

$$2 + 3 = 5.$$

4. **tangent to the dashes**

It follows the tangent directions.

5. $y_n + h f(x_n, y_n)$

Old y plus slope times step.

6. $\frac{dy}{dx} = xy$

xy factors as $(x\text{-part}) \times (y\text{-part})$; a sum does not.

7. **True**

$$\frac{dy}{dx} = 3e^{3x} = 3y. \quad \checkmark$$

8. **False**

Each point has one slope, so solution curves never cross.

9. **1.5**

$$1 + 0.5(1) = 1.5.$$

10. **4**

$$5 = 1 + C \Rightarrow C = 4.$$