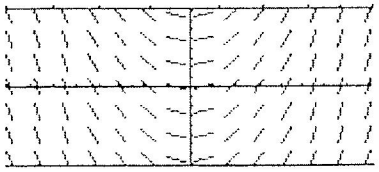
1) $\int_0^1 e^{-4x}\,dx$

(A) $\frac{-e^{-4}}{4}$ (B) $-4e^{-4}$ (C) $e^{-4}-1$ (D) $\frac{1}{4}-\frac{e^{-4}}{4}$ (E) $4-4e^{-4}$

2) Which of the following could be a solution of the differential equation with the given slope field?

(A) $y=x+1$ (B) $y=x^2+2$ (C) $y=x^3-2$
(D) $y=\ln(x+1)$ (E) $y=2e^x$



3) $\frac{dy}{dt}=\frac{t^2}{y}$

On the positive $y$-axis, the slope field for the differential equation has

(A) Horizontal segments (B) Vertical segments (C) Segments with positive slope (D) Segments with negative slope (E) Segments with slope equal to 1

4) Which of the following differential equations has $x^2-4y^2=4$ as a solution?

(A) $\frac{dy}{dx}=4xy$ (B) $y\frac{dy}{dx}=\frac{x}{4}$ (C) $\frac{dy}{dx}=\frac{4y}{x}$ (D) $\frac{dy}{dx}=-\frac{x}{4y}$ (E) $\frac{dy}{dx}=\frac{4x}{y}$

5) $\int\frac{5}{1+x^2}dx=$

(A) $\frac{-10x}{(1+x^2)^2}+C$ (B) $\frac{5}{2x}\ln(1+x^2)+C$ (C) $5x-\frac{5}{x}+C$ (D) $5\arctan x+C$ (E) $5\ln(1+x^2)+C$

6) $\int_1^2 \frac{x-4}{x^2}\,dx =$

(A) – ½ (B) ln2 – 2 (C) ln2 (D) 2 (E) ln2 + 2

7) The average value of the function $f(x) = e^{-x}\sin(x)$ on the closed interval $[1, \pi]$ is

(A) 0.129 (B) 0.145 (C) 0.155 (D) 0.276 (E) 0.310

8) The slope of the line tangent to the curve $y^2 + (xy + 1)^3 = 0$ at $(2, -1)$ is

(A) –3/2 (B) –3/4 (C) 0 (D) ¾ (E) 3/2

9) If $y = \arctan(e^{2x})$, then $\frac{dy}{dx} =$

(A) $\frac{2e^{2x}}{\sqrt{1-e^{4x}}}$ (B) $\frac{2e^{2x}}{1+e^{4x}}$ (C) $\frac{e^{2x}}{1+e^{4x}}$ (D) $\frac{1}{\sqrt{1-e^{4x}}}$ (E) $\frac{1}{1+e^{4x}}$

10) If $\frac{dy}{dx} = (1+\ln x)y$ and if $y = 1$ when $x = 1$, then $y =$

(A) $e^{\frac{x^2-1}{x^2}}$ (B) $1+\ln x$ (C) $\ln x$ (D) $e^{2x+x\ln x-2}$ (E) $e^{x\ln x}$

11) If $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 1$, use Euler's method with $\Delta x = 0.1$ to approximate the value of $y$ when $x = 1.3$.

(A) 1.693 (B) 1.353 (C) 1.483 (D) 2.183 (E) 1.766

12) The half-life of Radium-226 is 1620 years. If 100 grams were present in a sample in the year 1000, how many grams would remain 1000 years later?

(a) 55.4 (b) 60.3 (c) 65.2 (d) 70.1 (e) 72.3

13) Newton's Law of Cooling states that the rate of change in the temperature $y$ of an object is proportional to the difference between the object's temperature and the temperature $y_0$ of the surrounding medium. Write the differential equation that models Newton's Law of Cooling.

(a) $\frac{dy}{dt} = -ky$ (b) $\frac{dy}{dt} = ky$ (c) $\frac{dy}{dt} = y - y_0$

(d) $\frac{dy}{dt} = k(y - y_0)$ (e) $\frac{dy}{dt} = ky_0y$