

Non-Calculator

1.

For which of the following does $\lim_{x \rightarrow \infty} f(x) = 0$?

I. $f(x) = \frac{\ln x}{x^{99}}$

II. $f(x) = \frac{e^x}{\ln x}$

III. $f(x) = \frac{x^{99}}{e^x}$

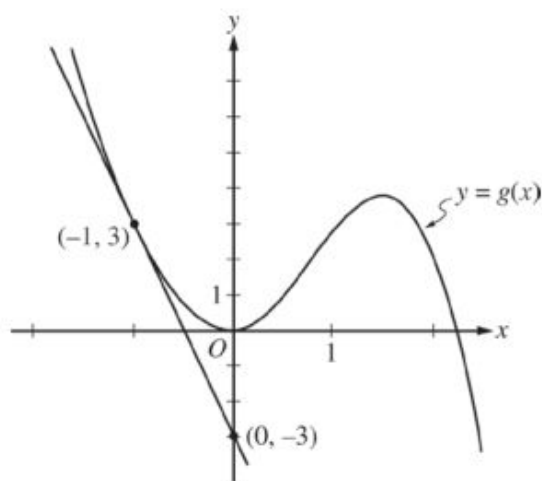
- (A) I only
(B) II only
(C) III only
(D) I and II only
(E) I and III only

2.

If $\ln(2x + y) = x + 1$, then $\frac{dy}{dx} =$

- (A) -2 (B) $2x + y - 2$ (C) $2x + y$ (D) $4x + 2y - 2$ (E) $y - \frac{y}{x}$

3.



The figure above shows the graph of the function g and the line tangent to the graph of g at $x = -1$. Let h be the function given by $h(x) = e^x \cdot g(x)$. What is the value of $h'(-1)$?

- (A) $\frac{9}{e}$ (B) $\frac{-3}{e}$ (C) $\frac{-6}{e}$ (D) $\frac{-6}{e} - \frac{3}{e^2}$ (E) -6

4.

$$\text{For } x > 0, \frac{d}{dx} \left(\int_0^{2x} \ln(t^3 + 1) dt \right) =$$

- (A) $\ln(x^3 + 1)$
- (B) $\ln(8x^3 + 1)$
- (C) $2\ln(x^3 + 1)$
- (D) $2\ln(8x^3 + 1)$
- (E) $24x^2 \ln(8x^3 + 1)$

Calculator

1.

A cup of tea is cooling in a room that has a constant temperature of 70 degrees Fahrenheit ($^{\circ}\text{F}$). If the initial temperature of the tea, at time $t = 0$ minutes, is 200°F and the temperature of the tea changes at the rate $R(t) = -6.89e^{-0.053t}$ degrees Fahrenheit per minute, what is the temperature, to the nearest degree, of the tea after 4 minutes?

- (A) 175°F (B) 130°F (C) 95°F (D) 70°F (E) 45°F