5. A relative maximum of the function $f(x) = \dfrac{(\ln x)^2}{x}$ occurs at

(A) 0

(B) 1

(C) 2

(D) e

(E) e^2

Ans

22. Let $f(x) = x \ln x$. The minimum value attained by f is

(A) $-\frac{1}{e}$

(B) 0

(C) $\frac{1}{e}$

(D) -1

(E) There is no minimum.

19. Find the coordinates of the absolute maximum point for the curve $y = xe^{-kx}$ where k is a fixed positive number.

(A) $\left(\frac{1}{k}, \frac{1}{ke}\right)$ (B) $\left(\frac{-1}{k}, \frac{-e}{k}\right)$ (C) $\left(\frac{1}{k}, \frac{1}{e^k}\right)$ (D) $(0, 0)$ (E) there is no maximum

Ans

6. Consider the function $f(x) = \frac{x^4}{2} - \frac{x^5}{10}$. The *derivative* of f attains its maximum value at $x =$

(A) 3

(B) 4

(C) 5

(D) 0

(E) there is no maximum

Ans $\square$

15. Find the maximum value of $f(x) = 2x^3 + 3x^2 - 12x + 4$ on the closed interval [0,2].

(A) –3

(B) 2

(C) 4

(D) 8

(E) 24

Ans

24. How many critical values does the function $f(x) = \arctan(2x - x^2)$ have?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

15. The number of bacteria in a culture is given by $N(t) = 200\ln(t^2 + 36)$, where t is measured in days. On what day is the change in growth a maximum?

(A) 4 (B) 6 (C) 8 (D) 10 (E) 12

11. A particle moves along the x-axis in such a way that its velocity at time $t > 0$ is given by $v = \frac{e^t}{t}$. At what value of t does v attain its minimum?

(A) 0

(B) 1

(C) e

(D) -1

(E) There is no minimum value of v.

Ans

3. The sale of lumber S (in millions of square feet) for the years 1980 to 1990 is modeled by the function

$$S(t) = 0.46\cos(0.45t + 3.15) + 3.4$$

where t is the time in years with $t = 0$ corresponding to the beginning of 1980. Determine the year when lumber sales were increasing at the greatest rate.

(A) 1982
(B) 1983
(C) 1984
(D) 1985
(E) 1986

Ans

6. The minimum distance from the origin to the curve $y = e^x$ is

(A) 0.72 (B) 0.74 (C) 0.76 (D) 0.78 (E) 0.80

Ans

20. The maximum distance, measured horizontally, between the graphs of $f(x) = x$ and $g(x) = x^2$ for $0 \leq x \leq 1$, is

(A) 1 (B) $\frac{3}{4}$ (C) $\frac{1}{2}$ (D) $\frac{1}{4}$ (E) $\frac{1}{8}$

Ans