

Please Mark Your Answers With a Nice Circle ○ NOT X!

Q1 Find the slant asymptote of $f(x) = \frac{x^2 + 1}{x}$.

(A) $y = x$ | (C) $y = x^2$ | (E) None

(B) $y = \frac{1}{x}$ | (D) $y = 1$

Q2 Find the inflection point of $f(x) = \arctan x$

(A) $x = \pi$ | (C) $x = -1$ | (E) None

(B) $x = 0$ | (D) $x = \frac{2}{\pi}$

Q3 Let $y = \ln(\ln x)$. Then find $y' = \frac{dy}{dx}$.

(A) $\ln x$ | (C) $\frac{1}{x \ln x}$ | (E) None

(B) $\frac{1}{\ln x}$ | (D) x

Q4 Suppose that $f = g \circ h + h \circ g$, $g(1) = 1$, $g'(1) = 2$, $h'(1) = 2$, $h(1) = 1$ then $f'(1) =$

(A) 8 | (C) 32 | (E) None

(B) 21 | (D) 64

Q5 The value of $\lim_{x \rightarrow 1} \frac{\sin(1-x)}{1-x^2}$ is

(A) -1 | (C) -2 | (E) None

(B) $1/2$ | (D) DNE

Q6 Find the minimum value of $f(x) = x^3 - 3x + 3$ on the interval $[-2, 4]$.

(A) -5 | (C) 1 | (E) None

(B) -1 | (D) 3

Q7 Given $f''(x) = \frac{x+3}{x-5}$. Find the intervals where $f(x)$ is concave downward.

(A) $(-\infty, 3)$ | (C) $(-\infty, 5)$ | (E) None

(B) $(-3, 5)$ | (D) $(5, \infty)$

Q8 The slope of the line tangent to the graph of $y = x^3 - x^2 + 1$ at $x = 2$ is

(A) 7 | (C) 11 | (E) None

(B) 8 | (D) 12

Q9 The value of $\lim_{x \rightarrow \infty} \frac{\sin(\frac{3}{x})}{\frac{1}{x}}$ is

(A) $\frac{1}{2}$ | (C) $\frac{3}{2}$ | (E) None

(B) 1 | (D) 3

Q10 Given $f''(x) = (x^2 - 1)(x - 1)$, find the x -value(s) of the inflection point(s).

(A) $x = -1$ | (C) $x = -1, 1$ | (E) None

(B) $x = 1$ | (D) $x = -1, 0, 1$

Q11 For what value of the constant c is the function f continuous at $x = 2$?

$$f(x) = \begin{cases} cx^3 + 1 & \text{if } x > 2 \\ 2x + 13 & \text{if } x \leq 2 \end{cases}$$

(A) 1 | (C) 3 | (E) None

(B) $2/5$ | (D) $17/9$

Q12 Find all the vertical asymptotes of $f(x) = \frac{(x-1)(x-2)}{(x-3)(x-2)(x+2)}$.

(A) $x = -2$ | (C) $x = -2, 3$ | (E) None

(B) $x = 2, 3$ | (D) $x = 1$

Q13 Determine the absolute minimum m and absolute maximum M for the function $f(x) = 2x^3 - 3x^2 - 12x$ on the interval $[-1, 1]$.

(A) $m = -20, M = 0$

(B) $m = -13, M = 7$

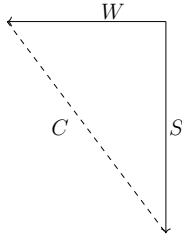
(C) $m = -20, M = 7$

(D) $m = -13, M = 0$

(E) None

Classical Problems: Your work must be clear and logical to receive full points.

Q1(25 pts) Two cars start moving from the same point. Car S travels south at 18 km/h and car W travels west at 24 km/h. At what rate is the distance between the cars increasing after ten minutes?



Solution:

Q2(25pts) Find two positive numbers x and y such that $x + y = 60$ and $M = xy^3$ is maximum.

Solution: