

Question 1

$A = \lim_{x \rightarrow \infty} \frac{x^3 - 4x^2 + 7}{3 - 6x - 2x^3}$ and $G(x) = 4x^3 - 2x^2 + 3x + 5$, find $G(A)$

Question 2

$$A = (x+3)(x^3 - 2x - 4)$$

$$B = \frac{(5x+2)}{x^3}$$

$$C = \cos x + 3e^{-x} \tan x$$

$$D = e^{(\ln x/2x)}$$

Find $A'(-1) + B'(-1) + C'(\pi) + D'(1)$

Question 3

Determine the equation of the tangent line to $\sin(xy) = y$ at

$$\left(\frac{\pi}{2}, 1\right)$$

Question 4

Which of the following has/have an inflection point at $x = 0$?

$$A(x) = x^{\frac{1}{5}}$$

$$B(x) = x^{\frac{3}{7}}$$

$$C(x) = x^{\frac{4}{5}}$$

$$D(x) = x^{\frac{4}{3}}$$

Question 5

Over what intervals is the graph $y = x^3 - 2x^2 - 20x - 8$ both decreasing and concave up?

Question 6

Find the exact area bounded by the graphs $y = 10 - \frac{x^2}{2}$ and $y = \frac{x^2}{2} - 3x$

Question 7

How many times do the graphs $y = \sin(x)$ and $y = \ln(x^2)$ intersect?

Question 8

Find $\frac{dy^2}{d^2x}$ for the equation $xy = x^2 + 2y$ at the point $(3, 9)$

Question 9

A particle's position is given by the equation

$$s(t) = t^3 - 8t^2 + 15t, t > 0$$

A = the product of all times at which the particle returns to the origin

B = the acceleration of the particle at $t = 3$

C = the average value of the velocity from $t = 1$ to $t = 2$

Find ABC

Question 10

Evaluate $f''(1)$, where $f(x) = \int_{x-1}^{x^3+x} (n^2 + 3n)dn$

Question 11

Evaluate the limit as x approaches 3 of $\frac{x^2 - 9}{x^2 - 9x + 18}$

Question 12

Four squares are cut out of the corners of a sheet of metal measuring 9 inches by 12 inches. The metal is then folded to form an open box. Find the maximum possible volume of this box. Round your answer to the nearest cubic inch.

Question 13

Find the area bounded by $y = x^2$, $x = \frac{1}{8}y^2$, $x = 1$ and $y = 3$

Question 14

The function f is implicitly defined as $y^2 = x^3 - x$. Evaluate $f''(x)$ at $(2, \sqrt{6})$

Question 15

A solid is formed so that every vertical cross section perpendicular to the x-axis is an equilateral triangle with two vertices on the circle $x^2 + y^2 = 9$. Find the volume of this solid.

CALCULUS TEAM ANSWERS

1) $\frac{5}{2}$

2) $\frac{7}{2} + 3e^{-\pi} \left(A = -1, B = 4, C = 3e^{-\pi}, D = \frac{1}{2} \right)$

3) $y=1$

4) $A(x)$ and $B(x)$

5) $\left(\frac{2}{3}, \frac{10}{3} \right)$

6) $\frac{343}{6}$

7) Two

8) $\frac{27}{8}$

9) -60 (A=15, B=2, C=-2)

10) 169

11) -2

12) 82

13) $2\sqrt{3} - \frac{19}{24} - \frac{4\sqrt{2}}{3}$

14) $\frac{23\sqrt{6}}{144}$

15) $36\sqrt{3}$