

DAV COLLEGE
 MAHARAJA GANESH DAS
 Final Examination

Mathematics I
Calculus I Commerce

Date: _____

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It is given that the function is continuous at $x = 3$. Find the value of k .

(4 marks) $f(x) = \frac{x^2 - k}{x^2 - 3}$

(4 marks) $f(x) = \frac{k - 3}{x - 3}$

(5 marks) Differentiate the function $f(x) = x^2$ using the first principle. Also find the derivative of $f(x) = \frac{x^2 + h - x^2}{h}$.

(4 marks) Find the derivative of $f(x) = x^3$ and $f(x) = \frac{1}{x}$.

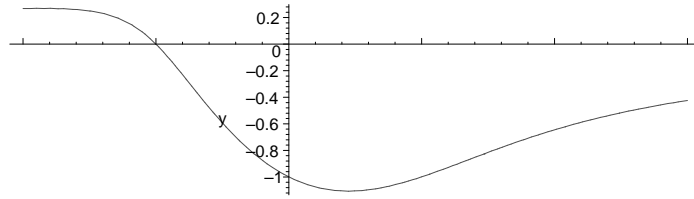
(5 marks) Find $f'(x)$ for $f(x) = \frac{x^2}{n} - \frac{x^2}{n}$.

(5 marks) Find the derivative of $f(x) = \ln x^2$, $\cos^3 x$ and $\arcsin x$.

(5 marks) Given that $f(x) = \frac{1}{x-1}$ is the inverse function of $f^{-1}(x)$.

(5 marks) Compute the derivative of $f(x) = e^{x^2} \sin x$.

(5 marks)



✓ (4 marks) Compute the own rate $\int \left(x^{2/3} e^x - \frac{1}{x^2} \right) dx$

✓ Consider the function $f(x) = x^4 - x^3$

✓ (1 marks) Give the domain of f

✓ (3 marks) Find the x-intercepts and any other y-intercept

✓ (3 marks) Find the intervals where f is increasing and the intervals where f is decreasing

✓ (1 marks) Find the local maxima and local minima

✓ (4 marks) Find the intervals where f is concave up and the intervals where f is concave down. Give the inflection points.

✓ (4 marks) Use the information above to sketch the graph of f . Your graph should be a rough sketch of the previous answers. Carry out the coordinate system for the graph. Use the intervals where f is increasing and the intervals where f is decreasing.

ANSWERS:

✓ a) \mathbb{R} b) \mathbb{R} $x - \int x^2 \frac{1}{x} - \frac{1}{x^2}$ $f(x) = x^4 - x^3$

✓ $f(x) = x^4 - x^3 = x^3(x - 1)$ $f'(x) = 4x^3 - 3x^2 = x^2(4x - 3)$ $f''(x) = 12x^2 - 6x = 6x(2x - 1)$

✓ $x = 0$ and $x = 1$ are the only x-intercepts.

✓ $f'(x) = x^2(4x - 3) = 0$ when $x = 0$ or $x = \frac{3}{4}$. $f''(\frac{3}{4}) = 6(\frac{3}{4})(2(\frac{3}{4}) - 1) = \frac{9}{2} > 0$, so $x = \frac{3}{4}$ is a local minimum.

✓ a) \mathbb{R} b) It will cause the revenue to increase. $y = -x^2 - x$

✓ b) $P(x) = -x^2 - x$. So the actual profit is the product of the price and the quantity. $P'(x) = -2x - 1$

✓ approx 1 persons per week

✓ No horizontal asymptote. Two vertical asymptotes at $x = 0$ and $x = 1$.

✓ $-x^{5/3} e^x - \frac{1}{x} + C$

✓ a) \mathbb{R} b) y intercept M_1 and x intercepts M_1 and M_2 , c f is increasing on M_1 and decreasing on M_2 , d f is concave up on M_1 and concave down on M_2 .