

Serial #:

Student #:

Name:

SHOW ALL YOUR WORK. NO CREDITS FOR ANSWERS NOT SUPPORTED BY WORK.

1. (30 points) Consider the function $f(x) = \frac{x^2}{x-1}$. Given that

$$f'(x) = \frac{x(x-2)}{(x-1)^2} \quad \text{and} \quad f''(x) = \frac{2}{(x-1)^3}.$$

- a) Find all asymptotes if any exists.
 - b) Find the critical numbers if any exists.
 - c) Find the increasing and decreasing intervals.
 - d) Find the local and absolute extrema if any exists.
 - e) Find the concavity intervals.
 - f) Find the inflection points if any exists.
 - g) Sketch the graph of the function. Clearly indicate all important points on the graph; such as, extrema, inflection points, and intercepts if any such points exist. Also the concavity must be clear.
2. (10 points) A book store sells 100 history books a month for SR30 each. For each SR2 increase in price, 4 fewer books will be sold each month. What price will yield maximum revenue, and what will this revenue be?
3. (10 points) Use differentials to estimate approximate $\ln 1.01$.
4. (10 points) Find The area between the x -axis and the graph of $f(x) = x^2 - 1$ from $x = -1$ to $x = 2$.
5. (40 points) Integrate each of the following:
- a) $\int \sqrt{x} \left(x + \frac{1}{x} \right) dx$
 - b) $\int \frac{e^x + 1}{e^x} dx$
 - c) $\int_1^e x \ln x dx$
 - d) $\int 5^x 3^{1-x} dx$