1. Given $f(x) = \ln(x^3) + \cosh(x) - \arctan(x)$

A Find $f'(x)$

B Find $f'(e)$

2. Consider the familiy of functions given by

$$f(x) = \frac{x}{(1+ax)^2} \quad \text{for} \quad a > 0.$$

Determine the value of a so that $f(x)$ has a local maximum at $x = 2$.

3. Consider the familiy of functions given by

$$f(x) = ax^2 - \ln(x) \quad \text{for} \quad a > 0 \quad \text{and} \quad \frac{1}{4} \leq x \leq 1$$

(A) Determine the value of a so that $f(x)$ has a local minimum at $x = \frac{1}{2}$.
(B) For this value of a, determine the x values of the global minima and global maxima of the function.

4. (HGM 4.4.32) If you have 300 feet of fencing and want to enclose a rectangular area up against a long, straight wall, what is the largest area you can enclose?

5 Determine the inflection point(s) for f given that

$$f''(x) = 3(x-2)^2(x+4)(x-5)^3.$$

6. Given the function.

$$g(x) = \frac{x^3}{(2-x)^2}.$$

Determine the critical points and classify them as local min or local max or neither local min- or max.

7. Consider the function

$$h(x) = 4x^5 - 10x^4.$$

Determine the inflection points.

8. Find $\frac{dy}{dx}$ in

$$y\ln(x) + \sinh(y^3) = x^2 - y^2.$$

9. Find a local linear approximation of $e^{(1-x)}$ near $x = 1$.

10. A furniture business rents chairs for conferences. A contract is drawn to rent and deliver up to 400 chairs for a particular meeting. The exact number would be determined by the customer later. The price will be \$90 per chair up to 300 chairs. If the order goes above 300 chairs, the price would be reduced by \$0.25 per chair for every additional chair ordered above 300. This reduced price would be applied to the entire order. Determine the largest and smallest revenues this business can make under this contract.

11. A rectangular dance floor of width w and length l feet is to be built inside a semicircular part of a room of radius 20 feet. Find the values of w and l that produce a floor of maximum area. Find the maximum area too.