

Math 142 In Class Exam 2 Review

1. A demand equation is given by  $p = 30e^{-0.02x}$   
Find the marginal revenue function.

2. Demand price for a product is  $p = -0.5x + 30$  where  $x$  is quantity produced and sold.  
Total cost for producing  $x$  units is  $C(x) = 12x + 40$ .

a) Use the marginal profit to approximate the change in profit if quantity increases from 15 to 16.

b) At what quantity is average profit a maximum?

3.  $f(x) = (x^2 - x - 6)^{1/3}$

a) At what  $x$ -values does  $f$  have a horizontal tangent?

b) At what  $x$ -values does  $f$  have a vertical tangent?

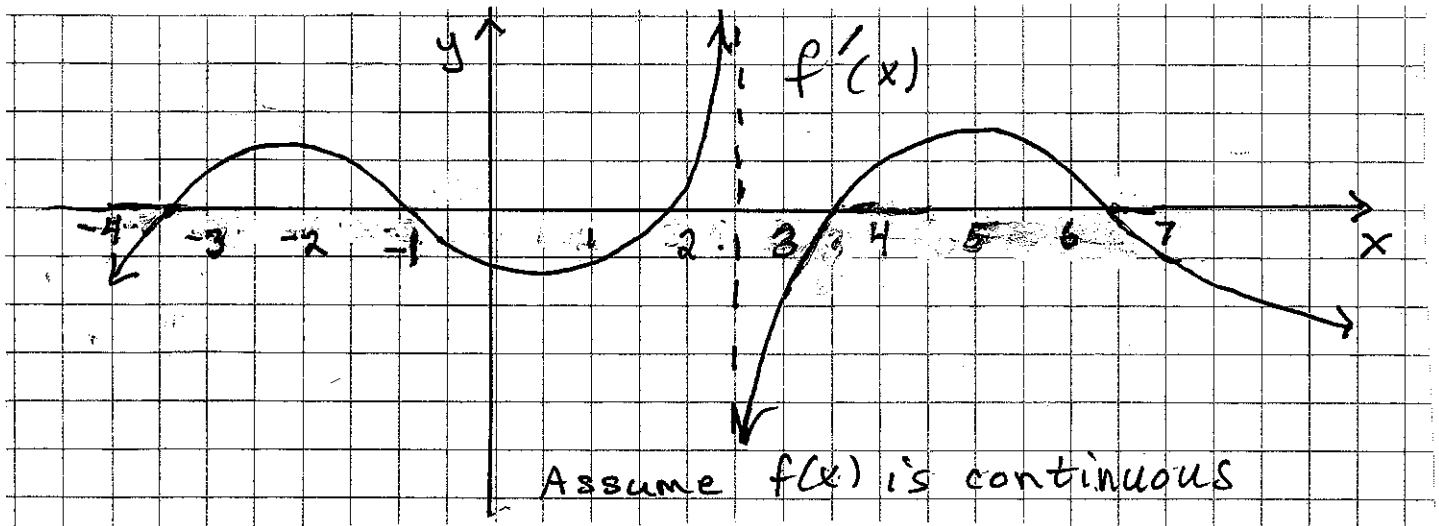
4. Find  $f'(x)$  for each. a)  $f(x) = \frac{e^{5x}}{2x^3 + 7}$

b)  $f(x) = 3^{x^4 - 6x^2 + 7}$

c)  $f(x) = \log \frac{\sqrt{x}}{(x^2 + 1)(x - 4)^3}$  d)  $f(x) = (x + 1)^3(x - 2)^4$  For

d) where is the tangent line horizontal?

5. The graph shows the derivative of  $f'(x)$ . Where is the tangent line to  $f(x)$  horizontal, where  $f$  is increasing/decreasing, concave up/down and locate all local extrema and inflection points of  $f(x)$ .



6. Demand quantity and price are related by  $x^2 + p^2 = 729$ .

a) Find the elasticity function,  $E(p)$ . At what value of  $p$  is revenue a maximum?

b) Will revenue increase or decrease if  $p$  increases from \$20 to \$25.

c) Find the approximate % change in demand if  $p$  increases from \$20 to \$25.

7. Find the absolute max and absolute min of  $f(x) = x^3 - 6x^2 + 9x$  on the interval  $[-1, 2]$ .

8.  $f(x) = \frac{2x^2 + 5x + 18}{x}$ .

Find any absolute extrema of  $f(x)$  on the interval  $(0, \infty)$ . Support your answer with the 2nd derivative test.

9. For each  $x$ -value, determine whether  $f(x)$  has a local min, local max, neither or state no conclusion can be made.

$x$	1	2	3	4
$f'(x)$	0	0	0	1
$f''(x)$	3	-2	0	-1

10. A rectangular storage unit has a volume of 1800 cubic feet. the length is 50% longer than the width. find the dimensions that minimize the surface area, including the flat roof.

11. Demand quantity for a product is 500/month when the price is \$40. Each \$1 decrease in the price increases demand by 20 units. Find the price that will maximize monthly revenue.

12. The current demand for a product is 500/month and the current price is \$40. The price is decreasing by \$1 per month and demand is increasing by 20 units per month. In how many months will revenue be a maximum?

13. Make a sign chart for each derivative. For the function with the given derivative, find all local extrema, intervals where the function is increasing, concave up and find any inflection points. (Only x-values can be found). In c, the function is continuous except at  $x=4$  which is a vertical asymptote.

a)  $f'(x) = (x+3)^2 e^{-x}$       b)  $f'(x) = x(2-x)e^{-x}$

c)  $f'(x) = \frac{x^2 - 3x + 2}{(x-4)^2}$