

# Math142 Week In Review # 7

## The Most Important Problems to Understand - This Week

A. Find the derivative of each of the following:

1.  $f(x) = 2x^3 - \frac{4}{x^2} + 10\sqrt{x} + e^2$

2.  $g(x) = \ln x - e^x + 5x$

3.  $h(x) = e^x (x^2 + 4)$

4.  $f(x) = \frac{e^x}{x^2 + 1}$

5.  $g(x) = \ln(\ln(x^2 + 1))$

6.  $h(x) = \log x^2$

7.  $f(x) = x^x$

B. Find the second derivative of each of the following:

8.  $y = e^x(x^2)$

9.  $y = \ln(x^2 - 1)$

The cost function for Rapid Rentals is given by  $C(x) = 120 + 50x^2$ , where  $x$  is the number of units rented in hundreds, and  $C(x)$  is measured in dollars.

10. What is the average change in cost when the rentals increase from 200 to 350?

11. Find the marginal average cost for 1,000 rentals.

12. a. Find the account balance if \$5000 is deposited in a CD which pays  $4\frac{1}{4}\%$  compounded continuously, in 12 years.

b. How long before the balance reaches \$12,000?

13. Approximate the revenue from the sale of the 5<sup>th</sup> item when the price-demand function is given by  $5x + 2p = 80$ .

14. Find the derivative of  $y = \ln [(x^2 + 1)^3 \cdot \sqrt{8x - 10}]$ . DNS

15. Find the derivative or  $y = \frac{e^{2x} - e^{-2x}}{e^{2x} + e^{-2x}}$ .

16. Find  $\frac{dy}{dx}$  if  $y = 8\sqrt{u}$  and  $u = \ln x$  at  $x = e^4$ .

17. Given the price  $p$  of an item is given by  $p = -\frac{1}{5}x + 20$ , find the elasticity of demand at  $p = \$4$ .

b. Should the price be raised, lowered, or stay the same?

c. If the price changes by 50%, how will the demand change?

18. Find the interval(s) where  $f(x)$  is increasing when  $f(x) = e^{-x} \cdot (x^2 - 6x + 1)$ .

19. Find the equation of the tangent to

$$y = \frac{\ln(x+1)}{e^x + 1} \text{ at } x = 0.$$

20. Sketch a graph of  $f(x)$  described below.

intercepts at  $x = -1, x = 2$

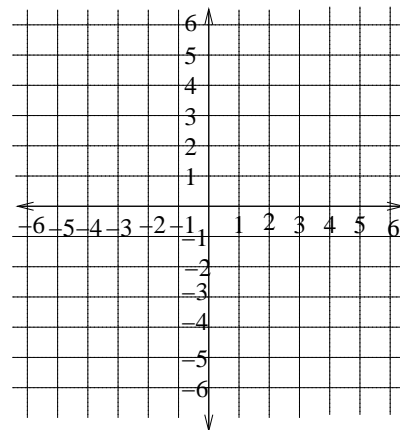
$$f' > 0 \text{ } (-3, 0)$$

$$f' < 0 \text{ } (-\infty, -3) \text{ } (0, \infty)$$

$$f'' > 0 \text{ } (-4, 0) \text{ } (0, \infty)$$

$$f'' < 0 \text{ } (-\infty, -4)$$

$$\lim_{x \rightarrow \infty} f(x) = -2$$



Answers

1.  $f'(x) = 6x^2 + \frac{8}{x^3} + \frac{5}{\sqrt{x}}$

2.  $g'(x) = \frac{1}{x} - e^x + 5$

3.  $h'(x) = e^x(x^2 + 2x + 4)$

4.  $f'(x) = \frac{e^x(x-1)^2}{(x^2+1)^2}$

5.  $g'(x) = \frac{2x}{x^2+1} \cdot \frac{1}{\ln(x^2+1)}$

6.  $h'(x) = \frac{2}{x \ln 10}$

7.  $f'(x) = x^x(1 + \ln x)$

8.  $y''(x) = e^x [x^2 + 4x + 2]$

9.  $y''(x) = \frac{-2(x^2+1)}{(x^2-1)^2}$

10. \$275

11. \$48.80

12. a. \$8326.46, b. approx. 20.6 years

13. \$20

14.  $y' = \frac{3(2x)}{x^2 + 1} + \frac{1}{x} \cdot \frac{8}{8x - 10}$

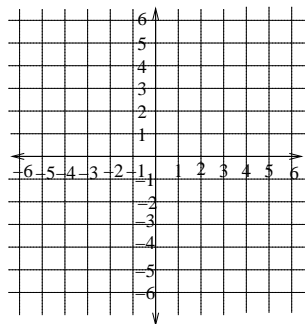
15.  $y'(x) = \frac{8}{(e^{2x} + e^{-2x})^2}$

16.  $\frac{dy}{dx} = \frac{2}{e^4}$

17. a.  $E(4) = 0.25$ , b. The price should be raised., c. The price increases 50%, then the demand will decrease  $12\frac{1}{2}\%$ .

18. increasing (1, 7)

19.  $y = \frac{1}{2}x$



20.