M119 Test #2 Study Guide Vernia

Problems 1-6. Differentiate (find $\frac{dy}{dx}$).

1. $y = x^{-3} + \sqrt{x^3}$

2. $y = \frac{3}{x} - \frac{x^2}{3} + x^{\frac{3}{2}} - \frac{x}{3} + \frac{1}{3x^2}$

3. f(x) = $(3x-2)(2x+1)$

4. $y = \frac{x^2+1}{1-x^2}$

5. $y = u^3 + 7$; $u = 2x - 8$

6. $f(x) = (x^3 - 2x^2 + 24)^5$

7. **Find the slope of the line that is tangent to its graph for the specified value of the independent variable.** $f(x) = -2x^2 + 4x + 12$; $x = 2$

8. **Find the rate of change of the function for the specified value of the independent variable.** $g(x) = \frac{1}{\sqrt{2x^2-1}}$; $x = 1$

9. **Find the equation for the line that is tangent to its graph for the specified value of the independent variable.** $y = -x^3 - 5x^2 + 3x - 1$; $x = -1$

10. **Find the second derivative of f(x).** f(x) = $2x^4 - 3x^3 + 6x - 22$

Problems 11 - 14. It is estimated that x months from now, the population of a certain community will be: $P(x) = x^2 + 20x + 8,000$.

11. At what **rate** will the population be changing with respect to time 15 months from now?

12. By how much will the population **actually** change during the 16th month?

13. At what **rate** is the populations **rate of change** changing with respect to time 15 months from now?

14. At what **percentage rate** will the population be changing with respect to time 15 months from now?

15. **Estimate** how f(x) = $x^2 + 2x - 4$ will change as x increases from 4 to 4.25.

Problems 16 through 19.
A manufacturer's total cost is c(q) $= 0.1q^3 - 0.5q^2 + 500q + 200$.

16. Use marginal analysis to estimate the cost of the forth unit.

17. Compute the actual cost of the fourth unit.

18. Estimate the **percentage change** in the function as the manager increases production from 4 units to 4.1 units.

19. Estimate the decrease in cost as the manager decreases production from 6 to 5.6 units.

20. An efficiency study of the morning shift at a certain factory indicates that an average worker arriving on the job at 8:00 A.M. will have assembled f(x) = $-x^3 + 6x^2 + 15x$ transistor radios x hours later. Estimate how many radios the worker assemble between 10:00 and 10:15 A.M.?

ANSWERS

1. $y' = \frac{-3}{x^4} + \frac{3\sqrt{x}}{2}$

2. $y' = \frac{-3}{x^2} - \frac{2x}{3} + \frac{3\sqrt{x}}{2} - \frac{1}{3} - \frac{2}{3x^3}$

3. $f'(x) = 12x - 1$

4. $\frac{4x}{(1-x^2)^2}$

5. $\frac{dy}{dx} = 6(2x-8)^2$

6. $f'(x) = 5(x^3 - 2x^2 + 24)^4(3x^2 - 4x)$

7. $slope = -4$

8. $rate\,of\,change = -2$

9. $y = 10x + 2$

10. $y'' = 24x^2 - 18x$

11. Increasing by 50 people per month

12. Increase by 51 people

13. 2

14. 0.6% increase

15. 2.5 increase

16. \$499.70

17. \$500.20

18. 2.3% increase

19. \$201.92 decrease

20. 6.75 radios