## OPMT 5701: Assignment 8: Differential and implicit differentiation

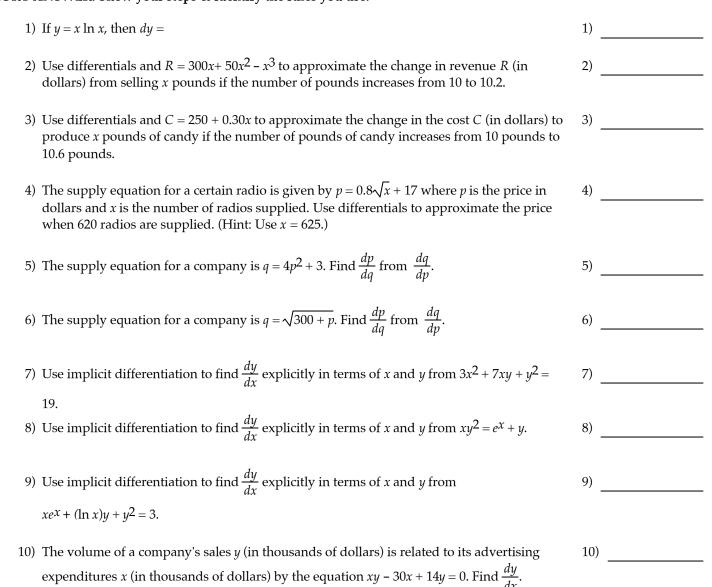
Read Chapters 5.1, 5.2 & appendix 2. Also the web-notes on differentials and Implicit function theorem

Questions 1 to 12 involve using the method of differentials. Sometimes you will need to rearrange terms to get the result necessary.

Questions 13–20 require the implicit function Theorem. Before attempting these problems be sure to review the notes and examples found on the website (note that the book also covers implicit differentiation in Appendix 2 but with a slightly different approach. Both methods will produce the same result.)

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## SHORT ANSWER: Show your steps & identify the rules you use.



- 11) Suppose that a company can produce 15,000 units when the number of hours of skilled labor y and unskilled labor x satisfy  $500 = (x+1)^{1/4}(y+9)^{1/5}$ . Find  $\frac{dy}{dx}$ , the rate of change of skilled labor hours with respect to unskilled labor hours.
- 11)
- 12) Suppose that a company can produce 12,000 units when the number of hours of skilled labor y and unskilled labor x satisfy  $384 = (x + 2)^3/4(y + 3)^{1/3}$ . Find  $\frac{dy}{dx}$ , the rate of change of skilled labor hours with respect to unskilled labor hours.
- 12)

13) If  $2x^2 + 3y^2 + 2z^2 = 16$ , find  $\frac{\partial z}{\partial y}$ .

13)

14) If  $x^2y + xz + z^2 = 4$ , find  $\frac{\partial z}{\partial x}$ .

14)

15) For  $x^2y + xz + z^2 = 4$ , evaluate  $\frac{\partial z}{\partial x}$  when x = -1, y = 2, z = -1.

- 15)
- 16) For  $x^2 + xy + yz + z^2 = 6$ , the partial derivative  $\frac{\partial z}{\partial y}$  evaluated at x = 1, y = 2, z = 1 is
- 16) \_\_\_\_\_
- 17) For  $e^{xy} + 7x^3 + 8z 18 = 0$ , the partial derivative  $\frac{\partial z}{\partial y}$  evaluated at x = -1, y = 0, z = 3 is
- 17)

18) Use implicit partial differentiation to find  $\frac{\partial z}{\partial x}$  from  $\ln(xyz) = e^{y} + 79$ .

18)

19) Use implicit partial differentiation to find  $\frac{\partial z}{\partial y}$  from  $e^{xy} + 7x^3 + 8z - 19 = 0$ .

19)

20) For  $2x^2 + 3y^2 + 2z^2 = 16$ , evaluate  $\frac{\partial z}{\partial y}$  when x = 1, y = 2, z = -1.

20)