Math 0120 Homework_12 is due : 08/25/2013 at 08:11pm EDT.

Reference: Berresford, Sections 7.1, 7.2

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1. (1 pt) A car rental company charges a one-time application fee of 25 dollars, 60 dollars per day, and 14 cents per mile for its cars.

(a) Write a formula for the cost, C, of renting a car as a function of the number of days, d, and the number of miles driven, m.
$C =$ ____________________

(b) If $C = f(d,m)$, then $f(4,560) =$ __________

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2. (1 pt) Consider the concentration, C, in mg per liter (L), of a drug in the blood as a function of x, the amount, in mg, of the drug given and t, the time in hours since the injection. For $0 \le x \le 3$ and $t \ge 0$, we have $C = f(x,t) = te^{-t(4-x)}$.

Find $f(1,2.5)$: __________________
(include ***units****)*

Be sure you can interpret what your answer means in terms of drug concentration, time and initial amount.

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3. (1 pt) Suppose $f(x,y) = xy^2 + 6$. Compute the following values:

$$\begin{aligned} f(2,-5) &= \underline{\hspace{3cm}} \\ f(-5,2) &= \underline{\hspace{3cm}} \\ f(0,0) &= \underline{\hspace{3cm}} \\ f(1,-5) &= \underline{\hspace{3cm}} \\ f(t,4t) &= \underline{\hspace{3cm}} \\ f(uv,u-v) &= \underline{\hspace{3cm}} \end{aligned}$$

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4. (1 pt) Find the partial derivatives indicated. Assume the variables are restricted to a domain on which the function is defined.

$$f(x,y) = x^3 + 4x^2y.$$

$f_x(2,4) =$ __________________
$f_y(2,4) =$ __________________

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5. (1 pt) Find the partial derivatives indicated. Assume the variables are restricted to a domain on which the function is defined.

$$z = \left(x^3 + x - y\right)^7.$$

$\frac{\partial z}{\partial x} =$ __________________
$\frac{\partial z}{\partial y} =$ __________________

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6. (1 pt) Find the partial derivatives indicated Assume the variables are restricted to a domain on which the function is defined.

$$z = x^6 + 4^y + x^y.$$

$z_x =$ __________________
$z_y =$ __________________

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7. (1 pt) Calculate all four second-order partial derivatives and check that $f_{xy} = f_{yx}$. Assume the variables are restricted to a domain on which the function is defined.

$$f(x,y) = e^{2xy}$$

$f_{xx} =$ ____________________________
$f_{yy} =$ ____________________________
$f_{xy} =$ ____________________________
$f_{yx} =$ ____________________________

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8. (1 pt) In cold weather, we feel colder when the wind blows. This is quantified by the wind chill index W, which is supposed to predict how cold we will feel for a given air temperature T, in degrees Fahrenheit, and wind speed V, in miles/hour. The National Weather Service uses the following formula:

$$W = 35.74 + 0.6215T - 35.75V^{0.16} + 0.4275TV^{0.16},$$

for $T \le 50$ and $V \ge 3$.

What is the wind chill index when the air temperature is 0 degrees and the wind speed is 5 miles/hour?
Answer: _____

Calculate the partial derivatives W_T and W_V when $T = 0$ and $V = 5$.
$W_T =$ _____
$W_V =$ _____

Use your answer above to do the following question: When the air temperature is 0 degrees, estimate the change in the wind chill index if the wind speed increases by 2 miles/hour from 5 miles/hour.
Answer: _____