Chapter 10 Checkpoint part b

Directions:

- You will have 1.5 hours to complete as many of the following questions as you can. When you begin the checkpoint, please write down the current time at the top of your cover page, and leave a space to write the time you finish. When you finish please immediately write the time.
- You may use your notes, the book, and any materials posted on the course website. Also, feel free to ask me clarifying questions or about typos. You may not use any other resource. In particular, you may not use any other resource on the internet, you may not use a computer to assist you with graphing or computations (unless the problem explicitly states otherwise) and you may not discuss the problems with anyone else.
- Each problem corresponds to a standard and specifically asks about that standard. You many complete as many or as few of the problems as you wish.
- If you have a question about any of the problems, or think there is an error please email me immediately. Also, if something occurs during your allotted time or some other special circumstance arises, please email me immediately.

Chapter 10: I can calculate, use, and interpret partial derivatives.

☐ D.1 ** I can evaluate limits of functions of two variables.

☐ D.2 I can evaluate and interpret first-order partial derivatives of functions of two variables using formulas, tables, graphs, and contour maps.

☐ D.3 I can evaluate and interpret second-order partial derivatives of functions of two variables using formulas, tables, graphs, and contour maps.

☐ D.4 I can find equations of tangent planes for functions of two variables and use them to approximate function values.

☐ D.5 ** I can compute and interpret derivatives using various chain rules.

☐ D.6 I can evaluate and interpret directional derivatives and gradients of functions of multiple variables.

☐ D.7 I can find and classify critical points of functions of two variables.

D.5 Suppose $x = x(s,t)$, $y = y(s,t)$ and $z = z(x,y)$. Use the table of values to find $\frac{\partial z}{\partial t}(1,0)$.

$x(1,0)$	2
$y(1,0)$	3
$z(2,3)$	5
$x_s(1,0)$	π
$y_s(1,0)$	e
$x_t(1,0)$	π^2
$y_t(1,0)$	e^2
$z_x(2,3)$	$\frac{1}{2}$
$z_y(2,3)$	17

D.6 Suppose Ellery and Ellis the elephant seals are moving along a beach modeled by the square $[0,2] \times [0,2]$ in km. The temperature at any point is given by $T(x,y) = x^2 - y^2 + 14$ degrees Celcius.

(a) Suppose Ellery is travelling from the point $(0,1)$ and will travel in the direction of greatest temperature increase. What is this direction?

(b) Suppose Ellis is travelling in the direction $\langle 1,2 \rangle$ from the point $(1,1)$. What is the rate of change of temperature Ellis experiences? Include units.

(c) If Ellery instead starts at the point $(1,0)$ and travels along the curve $x^2 - y^2 = 1$, what is the rate of change of temperature Ellery is experiencing. Include units.

D.7 (a) Find all the critical points of the function

$$f(x,y) = 2x^2 + \frac{4}{3}y^3 - y + 3.$$

(b) Compute the Hessian matrix for f.

(c) For each of the critical points (a,b), use the Hessian to classify the critical points as local mixima, local minima, saddle points, or point state that the second derivative test is inconclusive.

(d) If we restrict the function $f(x,y)$ to the square $[0,1] \times [0,1]$, where does it achieve its absolute maximum and minimum values? (For this part of the problem you may use a computer to evaluate the function at varius points).