Quiz 3 - Answers

#2, p. 656

$z_x(1,1) = e$, $z_y(1,1) = 0$, $\underline{z = ex}$

#16, p. 657

$T(2.04, 0.97) \cong 136.04°C$

#18, p. 663

$f_x = \frac{-2x}{(x^2+y^2)^2}$, $f_y = \frac{-2y}{(x^2+y^2)^2}$, $\nabla f(-1,3) = \frac{2}{100}\vec{i} - \frac{6}{100}\vec{j}$

#36, p. 664

$-\frac{46}{5}$

#66, p. 665

(a) The level curves are circles $x^2+y^2 = \frac{100}{c} - 1$.

(b) At the origin. $T(0,0) = 100°$

(c) The direction of the greatest increase at $(3,2)$: $-3\vec{i} - 2\vec{j}$.

$\nabla T(3,2) = \frac{200}{196}(-3\vec{i} - 2\vec{j})$. $\|\nabla T(3,2)\| = \frac{50\sqrt{13}}{49}$

(d) The greatest decrease: $\frac{200}{196}(3\vec{i} + 2\vec{j})$.

26 (a), p. 671

$1.2(x-0.6) + 1.6(y-0.8) + 6(z-1) = 0$

Quiz IV - Answers

#6, p. 679

$$\frac{dz}{dt} = \frac{\partial z}{\partial x}\cdot\frac{dx}{dt} + \frac{\partial z}{\partial y}\cdot\frac{dy}{dt} = 2e^{y} + (xe^{y} + e^{y} + ye^{y})(-2t) =$$
$$= 2e^{(1-t^2)}(1-2t^2-2t+t^3).$$

#8, p.679

The problem is most easily solved by substitution:

$$z = \cos(u^2((\cos v)^2 + (\sin v)^2)) = \cos(u^2)$$

$$\frac{\partial z}{\partial u} = -2u\sin(u^2), \qquad \frac{\partial z}{\partial v} = 0.$$

#10, p. 686

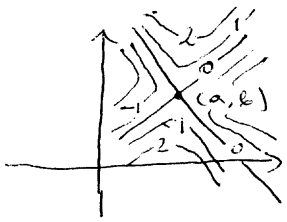
$$f(x,y) = \sin(x^2+y^2)$$
$$f_{xx}(x,y) = 2\cos(x^2+y^2) - 4x^2\sin(x^2+y^2)$$
$$f_{yy}(x,y) = 2\cos(x^2+y^2) - 4y^2\sin(x^2+y^2)$$
$$f_{xy}(x,y) = f_{yx}(x,y) = -4xy\sin(x^2+y^2).$$

#22, p 709

$f_x(a,b) = f_y(a,b) = 0$, thus, (a,b) is a critical point.

Since $f_{xx}(a,b) > 0$, $f_{yy}(a,b) = 0$, $f_{xy}(a,b) > 0$, we have

$D(a,b) < 0$. Hence, (a,b) is a saddle point.



#6, p.709

$f_x = 3x^2 - 6x$, $\quad f_y = 2y + 10$. Crt. pts.: $(0,-5)$, $(2,-5)$

$D(x,y) = 12x - 12$, $\quad D(0,-5) = -12 < 0$. Thus, $(0,-5)$ is a saddle point.

$D(2,-5) = 12 > 0$, $f_{xx}(2,-5) = 6 > 0$. Thus, $(2,-5)$ is a loc. min.