Math 18, Solns to selected HW problems, §§ 2.1 & 2.~~1~~3, Due 9/19

2.1: #20   2.~~1~~3: # 2, 8

2.1.20 $x + 2z = 4$ is a plane through the pt. $(0,0,2)$, perpendicular to the vector $(1,0,2)$.

2.3.2 a) $z = (a^2 - x^2 - y^2)^{\frac{1}{2}}$ $\quad \frac{\partial z}{\partial x} = -x\,(a^2-x^2-y^2)^{-\frac{1}{2}}$, $\frac{\partial z}{\partial y} = -y\,(a^2-x^2-y^2)^{-\frac{1}{2}}$

So $z_x(0,0) = z_y(0,0) = 0$, & $z_x(\frac{a}{2}, \frac{a}{2}) = -\frac{a}{2} \cdot \frac{1}{\sqrt{\frac{a^2}{2}}} = z_y(\frac{a}{2}, \frac{a}{2})$

b) $z = \ln (1+xy)^{\frac{1}{2}}$ $\quad z_x = \frac{1}{2} \cdot y \cdot (1+xy)^{-\frac{1}{2}} \cdot \frac{1}{(1+xy)^{\frac{1}{2}}} = \frac{y}{2(1+xy)}$

$z_y = \frac{x}{2(1+xy)}$, $z_x(1,2) = \boxed{\frac{1}{3}}$, $z_y(1,2) = \frac{1}{6}$

$z_x(0,0) = 0 = z_y(0,0)$

c) $z = e^{ax}\cos(bx+y)$, $z_x = a e^{ax}\cos(bx+y) + -b e^{ax}\sin(bx+y)$

$z_y = -e^{ax}\sin(bx+y)$ $\quad z_x(\frac{2\pi}{b}, 0) = a e^{2\pi a/b}$

$z_y(\frac{2\pi}{b}, 0) = 0$

2.3.8 a) $\begin{bmatrix} e^x & 0 \\ y\cos xy & x\cos xy \end{bmatrix}$ b) $\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ c) $\begin{bmatrix} 1 & 1 \\ 1 & -1 \\ y & x \end{bmatrix}$

d) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -5 \\ 1 & -1 & 0 \end{bmatrix}$