1. a) $\frac{\partial}{\partial x_1}\left(\ln(ax_1x_2+bx_1+cx_1^2) \right)$

$$\boxed{\frac{1}{ax_1x_2+bx_1+cx_1^2}\cdot(ax_2+b+2cx_1)}$$

b) $\int_b^\infty a\cdot e^{-a(x-b)}\,dx \qquad a>0$

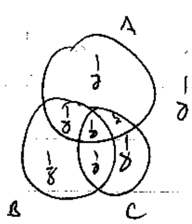
$= a\cdot\frac{1}{-a}\cdot e^{-a(x-b)}\Big|_b^\infty$

$= -e^{-ax+ab}\Big|_b^\infty = 0+e^0 = \boxed{1}$

2. (a) False if A and B mutually exclusive

$P(A\cup B) = P(A)+P(B)$

(b)

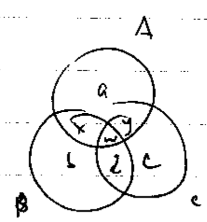


$P(A\cap B\cap C)$

$P(A)\cdot P(B|A)$

$\cancel{P(A)}\cdot\frac{P(B\cap A)}{\cancel{P(A)}}\cdot\frac{P(C\cap B)}{P(B)}$

$P(B\cap A)$



$\frac{x+w}{x+w+b+z}\cdot(w+z) \neq w$

FALSE

(c) $P(A=0)=0$

b/c continuous distribution

$$P(A=0) = \int_0^0 \quad = 0$$

3\. a) $\|x\|_1 = \sum_{i=1}^{n} |x_i| = 3$

$$\|x\|_2 = \sqrt{\sum_{i=1}^{n} x_i^2} = \sqrt{5}$$

$$\boxed{\sqrt{5}/3}$$

b) $\begin{bmatrix} 1 \\ 2 \end{bmatrix} \begin{bmatrix} 1 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$

4\. a) $A \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \qquad B \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$

(b) $C = \begin{bmatrix} 1 & 4 \\ 3 & 8 \end{bmatrix} \qquad D = \begin{bmatrix} 1 & 0 \\ 0 & 8 \end{bmatrix}$

5\.