Find $\int_0^\infty e^{-x}\,dx$ showing your work carefully and using a limit.

$$\int_0^b e^{-x}\,dx = -e^{-x}\Big|_0^b = -e^{-b} - (-e^0) = 1 - e^{-b}$$

$$\int_0^\infty e^{-x}\,dx = \lim_{b\to\infty} \int_0^b e^{-x}\,dx = \lim_{b\to\infty} (1 - \cancel{e^{-b}}^{\to 0}) = 1$$

1 a) 0.09
b) 0.49
c) .281
d) .17

e) 0.29
f) .44
g) .42

$P(X=2)=g(2)$ $P(X=1, y=2)=f(1,2)$

2 a) $f(3,2)$

e) $f(2,1)+f(3,2)+f(4,3)$

b) $g(3)+h(2)-f(3,2)$

f) $f(2,1)+f(2,2)+f(3,1)+f(3,2)+f(4,1)+f(4,2)$

c) $\frac{f(3,2)}{h(2)}$

d) $f(1,2)+f(2,1)$

g) $g(4)+f(3,1)+f(3,2)+f(2,1)$

$$P(X \geq 2, Y \leq 2) = f(2,1) + f(2,2) + f(3,1) + f(3,2) + f(4,1) + f(4,2)$$

$$= \sum_{x=2}^{4} \sum_{y=1}^{2} f(x,y) = f(2,1) + f(2,2) + f(3,1) + f(3,2) + f(4,1) + f(4,2)$$

$$= \sum_{y=1}^{2} \sum_{x=2}^{4} f(x,y)$$

$$P(X \geq Y+1) = \sum_{x=2}^{4} \sum_{y=1}^{x-1} f(x,y)$$

$$P(X \geq Y+1) = \sum_{y=1}^{3} \sum_{x=y+1}^{4} f(x,y)$$

$$= f(2,1) + f(3,1)$$
$$f(3,2) + (4,1)$$
$$+ f(4,2) + f(4,3)$$