Leti X and Y be continuous of the Asjoint probability density function f(x,y) oform these two variables is a function satisfying of (xxx) 7-pps and = (x), (8) = (8) = 1 · (4x) + f(xx) + dx (dy) = 1 · (4x) d = (8) d P(a < x < b, c < p x < d) = f (x, y) dy dx = x) q Two random variables X and Y are said to 23 The manginal probability density functions of X and Y, denoted $f_{x}(x)$ and $f_{y}(y)$, respectively, when X and Y are discreted f(x)? f(x)then x and Y and Y for to ope of ependent. e) Ane X and Y are said to be Two continious RV's independent if for every pain of x and y values f(x,y) = fx(x).fy(y) when(x) and Y are (5,6)4 + (8),4 - (8),4 Continious. If its is not satisfied for all (xxx), then

If it is just satisfied for all of (x, y), then x and Y are said to be dependent.

1,2,3,69,11,12,19

Eg. Each finant time on a particular type of vehicle) is supposed to be filled to a pressure of 26 psi. suppose the actual air pressure in each tire is a ry X for the Soight x times and Y for the pleft time, with joint pdf $F(x,y) = \begin{cases} K(x^2+y^2) \times 20 \in x \in 30, 20 \le y \le 30 \\ 0 & \text{otherwise}, \end{cases}$ a) What is the value of "k" S f(x,y) dx dy = 18 1 K(x2+y2) dx dy 1= $= K \left(\int_{20}^{30} \int_{20}^{30} (x^2 + y^2) dx dy + \int_{20}^{30} y^2 dx dy \right)^{-3}$ $= K \int_{x^2}^{2} (y|_{20}^{30}) dx + \int_{x^2}^{30} (x|_{20}^{30}) dy =$ $= K \left(\frac{10}{3} \left| \frac{x^3}{3} \right|_{20}^{300} + \frac{35}{3} \left| \frac{30}{20} \right|_{30}^{30} \right) \left(\frac{35}{3} \right) \left(\frac{30}{30} \right) \left(\frac{35}{30} \right) \left(\frac{35}{3$ $= 20 \text{ Kr} \left(\frac{30^3}{3} \approx \frac{20^3}{3} \right)^{3/2} = \frac{380,000 \text{ K}}{3} = \frac{5}{3} \approx \frac{5}{3} \times \frac{$ b) What is the probability that both tires are underfilled.

P(X < 2.6 and Y < 26) = P(20 < X < 26 and 20 < Y < 26) $= \int_{26}^{26} \int_{26}^{26} |X(x^2 + y^2)| dx dy = \frac{3}{380,000} \left(\int_{20}^{26} \int_{20}^{26} |x^2| dx dy \right)$ $= 0.3024 \int_{20}^{26} |x^2| dx dy$

= 0.3024/

(c.) What in the probability that the difference in air pressure bet? two tines is at most 1922 psi? (30P) [1x=41x+2] = Brod-2016+ x+40(202) odl- 80) X CE > 6 > = (p (x > 2 < 0 4 < x + 2 6) 5 r) > (go = -29) $= \iint f(x,y) dx dy$ II $= 1 + \left(x \iint_{\Gamma} f(x, y) dx dy + \iint_{\Gamma} f(x, y) dx dy \right) + \int_{\Gamma} f(x, y) dx dy$ $= 1 - \int_{20}^{28} \int_{x+2}^{30} k(x^2+y^2) dxdy = - \int_{20}^{30} \int_{x+2}^{1-2} k(x^2+y^2) dxdy + \int_{x+2}^{30} \int_{x+2}^{1-2} k(x^2+y^2) dxdy$ 1766.3203 - 0.3203 + xb. (() - 5x) = = 0.3594 $= K \left(\int_{20}^{28} (y |_{x+2})^{30} \right) = \frac{1000.086}{200.086} = \frac{28}{20} \left(\frac{30}{30} \right) = \frac{28}{65} = \frac{28}{30} \left(\frac{30}{30} \right) = \frac{28}{65} = \frac{28}{30} = \frac{28$. 15 11 16 v bood 28 (30 Hx 172) dx 1 3 1 10 (303 - (x+2)3) dx (35>Y 205 by 35> x 205) 9 = (1) > / 0.32 035, x) 9 = KJX (16554.67 + 1/3. 72064) = 0.32 035, x) 9 K (x2+y2) dxdy = 380,000(20. 1 20 20 30 30 dady

(d) Determine the (marginal) distribution of air pressure in the night tive alone. $-\infty f(x,y) = \int_{-\infty}^{\infty} f(x,y) dy = \int_{-\infty}^{\infty} K(x^2 + y^2) dy = \int_{-\infty}^{\infty} f(x,y) dy = \int_$ $= K \left(\frac{y^{2}}{x^{2}} + \frac{y^{3}}{3} \right)^{30}$ they thing sit, 200 = 18 (10, x2 +00:05), 17 a'may sit \$1 $\pm f_{Y}(y) = \int_{0}^{\infty} f(x,y) dx = \int_{0}^{30} k(x^{2}+y^{2}) dx = k(10y^{2}+0.05)$ for any in intervals [auti]..., [aniba], (e) Are x and it independent revis. check f(x,y) = fx (2). fy(3) - (,d2, X > 10) $K(x^2+y^2) \neq K(10x^2+0.05) \cdot K(10y^2+0.05)$. (Not Prodependent) -X (x) x sold sinov mobiles of be independent if for every subset Xi, Xi, Xi, of the variables, the joint pmf or pelf if the Subject to the product of the inarginal pmf's or pdf's. Conditional distributions. Let X and Y be two continions toy's with joint past f(x,x) and morginal X pass fx (x). Then for any X value . x for which fx(x)>0, the conditional probability assisty function of Y Then that X = x is $f_{(X|X)} = \frac{f(x,y)}{f_{(X|X)}}$.