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### Homework I

1) Find volume under  $z = 1 - x^2$  and above region  $0 \leq y \leq 1, 0 \leq x \leq y$

$$\int_0^1 \int_0^y (1 - x^2) dx dy = \int_0^1 \left( y - \frac{y^3}{3} \right) dy = \frac{5}{12}$$

2) Calculate  $\int_3^4 \int_1^2 \frac{1}{(x+y)^2} dy dx$

We have:  $u = x + y \Rightarrow du = dx$   
 $\Rightarrow \int_3^4 \int_1^{2+x} \frac{1}{u^2} du dx \Rightarrow \int_3^4 \int_{1+x}^{2+x} -\frac{1}{u} dx$   
 $\Rightarrow \int_3^4 \int_1^2 -\frac{1}{x+y} dx = \int_3^4 \left[ -\frac{1}{x+2} + \frac{1}{x+1} \right] dx$   
 $= -\ln(x+2) + \ln(x+1) \Big|_3^4 = -\ln(6) + \ln(5) + \ln(5) - \ln(4)$   
 $= 2\ln(5) - \ln(6) - \ln(4)$

3) Write the equations for the curves that bound the domain of integration in

$$\int_0^4 \int_y^{10-y} f(x, y) dx dy$$

x curves:  $x = y$ ,  $x = 10 - y$ ,  $y \leq x \leq 10 - y$

y curves:  $y = 0$ ,  $y = 4$

The domain sketch : The domain is trapezoid ABCD

