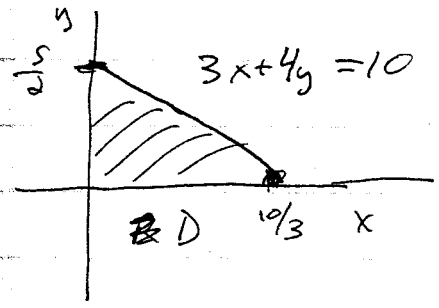
Math 18 Answers to selected HW problems, Ch. 5, due 10/31

5.3.6, 5.4.12, 5.6.14

5.3.6



$3x+4y=10$

$4y = 10-3x$

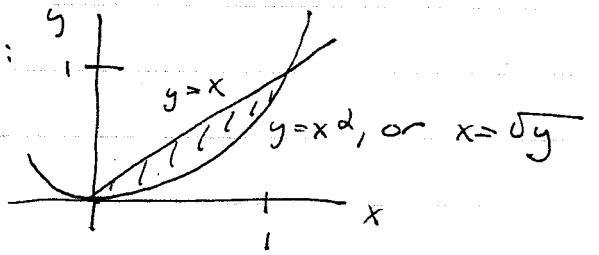
$y = \frac{10-3x}{4}$

So $\iint_D (x^2+y^2)\,dA = \int_0^{10/3}\int_0^{\frac{10-3x}{4}} (x^2+y^2)\,dy\,dx$

$= \int_0^{10/3} \left(x^2y + \frac{1}{3}y^3\right)\Big|_0^{\frac{10-3x}{4}} dx = \int_0^{10/3} x^2\left(\frac{10-3x}{4}\right) + \frac{1}{3}\left(\frac{10-3x}{4}\right)^3 dx$

$= 12.0563$ (Mathematica)

5.4.12 $\int_0^1 \int_{x^2}^{x} f(x,y)\,dy\,dx$. Region:



Changing the order, we get $\int_0^1 \int_y^{\sqrt{y}} f(x,y)\,dx\,dy$

5.6.14 $\int_0^1 \int_0^x \int_0^y (y+xz)\,dz\,dy\,dx = \int_0^1 \int_0^x \left(yz + \frac{1}{2}xz^2\Big|_{z=0}^{y}\right) dy\,dx$

$= \int_0^1 \int_0^x \left(y^2 + \frac{1}{2}xy^2\right) dy\,dx = \int_0^1 \left(\frac{1}{3}y^3 + \frac{1}{6}xy^3\Big|_{y=0}^{x}\right) dx$

$= \int_0^1 \left(\frac{1}{3}x^3 + \frac{1}{6}x^4\right) dx = \frac{1}{12} + \frac{1}{30} = \frac{5}{60} + \frac{2}{60} = \frac{7}{60}$