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Gajendra Purohit

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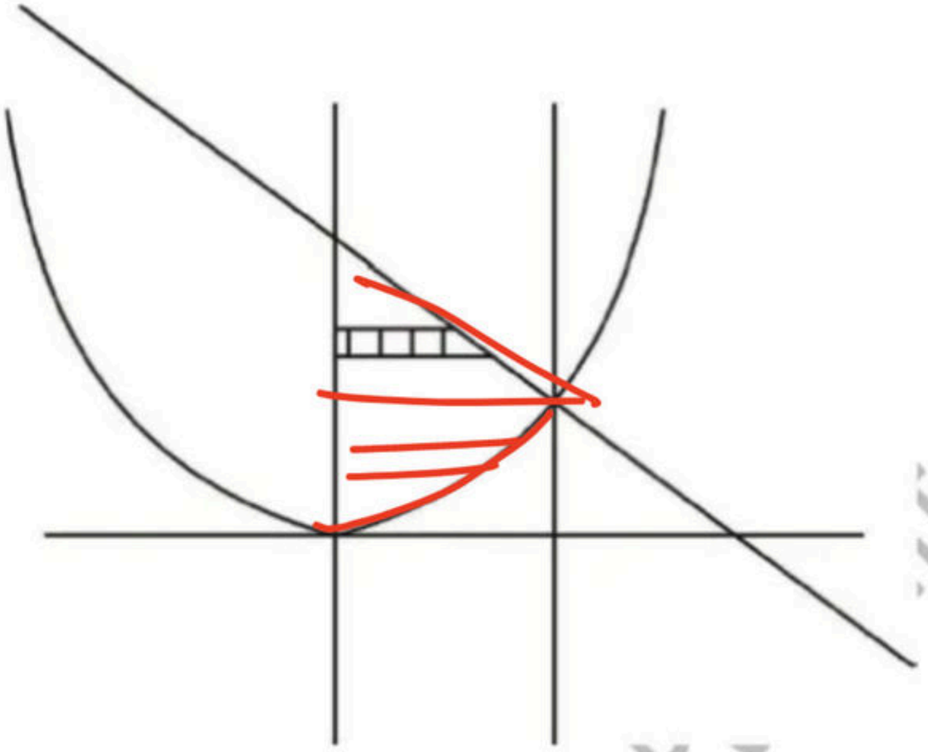
Change of order in mixed region

We know that if strip move on more than two curve then t
region is called mixed region.

Example :



Then for double integration, we divide into simple region.

$$\int_{x=0}^{2a}\int_{y=\frac{x^2}{4a}}^{3a-x} f(x,y)\,dy\,dx$$

$x=0$

$x=2a$

$y=\frac{x^2}{4a}$

$y=3a-x$

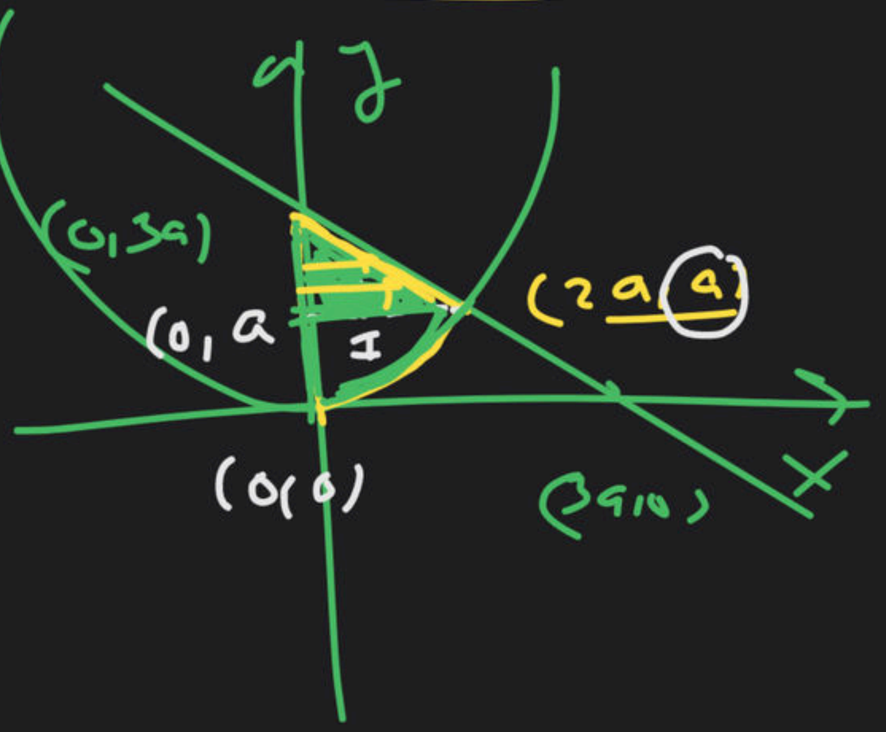
$x+y=3a$

$x^2=4ay$

$$\int_{y=0}^{a}\int_{x=0}^{2\sqrt{ay}} f(x,y)\,dx\,dy + \int_{y=a}^{3a}\int_{x=0}^{3a-y} f(x,y)\,dx\,dy$$

I

II



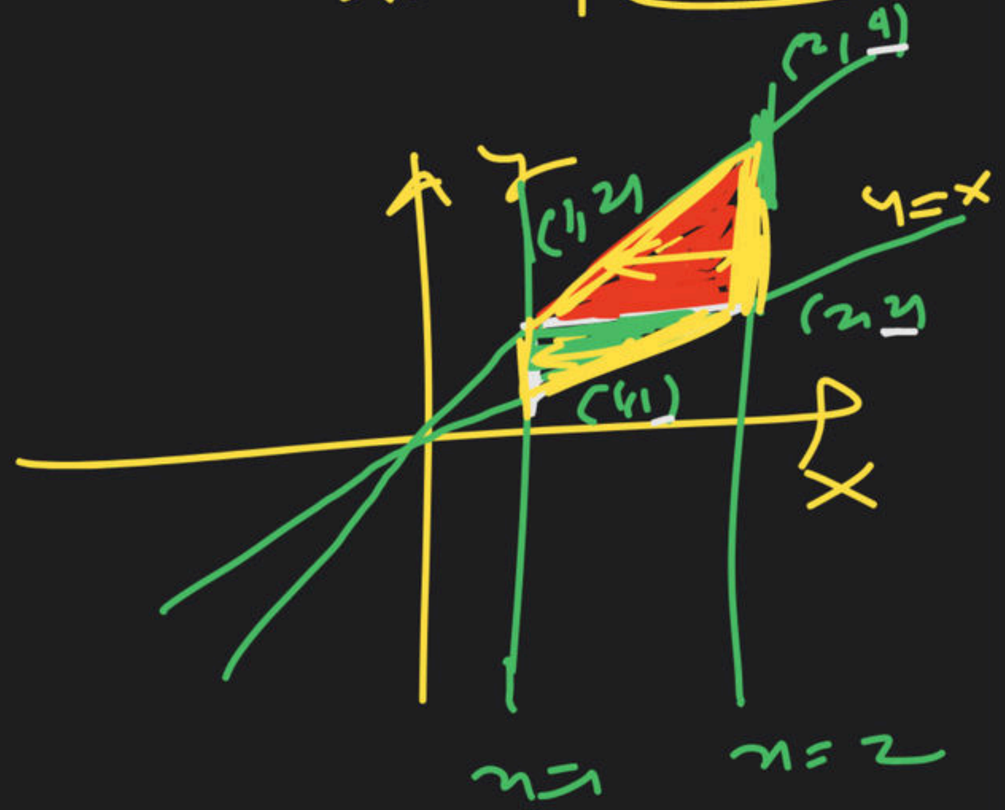
$$\int_{x=1}^{2}\int_{y=x}^{2x} f(x,y)\,dy\,dx$$

$$\int_{y=1}^{2}\int_{x=1}^{y} f(x,y)\,dx\,dy + \int_{y=2}^{4}\int_{x=y/2}^{2} f(x,y)\,dx\,dy$$

I

II

$x=1$
$x=2$ | $y=x$
$y=2x$



Q1. Change the order of integration $\int_0^1 \int_{x-1}^{\sqrt{1-x^2}} f(x,y)\,dy\,dx$.

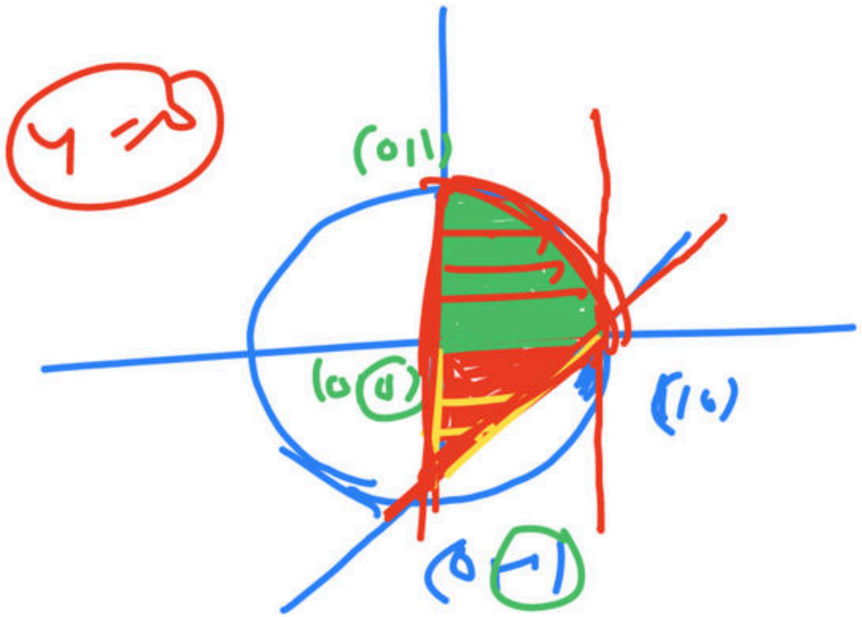
IIT-JAM-2010

(a) $\int_0^1 \int_0^{\sqrt{1-y^2}} f(x,y)\,dx\,dy + \int_{-1}^0 \int_0^{1+y} f(x,y)\,dx\,dy$

(b) $\int_0^1 \int_0^{\sqrt{1-y^2}} f(x,y)\,dx\,dy - \int_{-1}^0 \int_0^{1+y} f(x,y)\,dx\,dy$

(c) $\int_0^1 \int_0^{1+y} f(x,y)\,dx\,dy - \int_{-1}^0 \int_0^{1+y} f(x,y)\,dx\,dy$

(d) None of these



Q2. The value of $\int_0^{\pi/2}\int_{\pi/2}^{\pi} \frac{\sin x}{x}\,dx\,dy + \int_{\pi/2}^{\pi}\int_{y}^{\pi} \frac{\sin x}{x}\,dx\,dy$

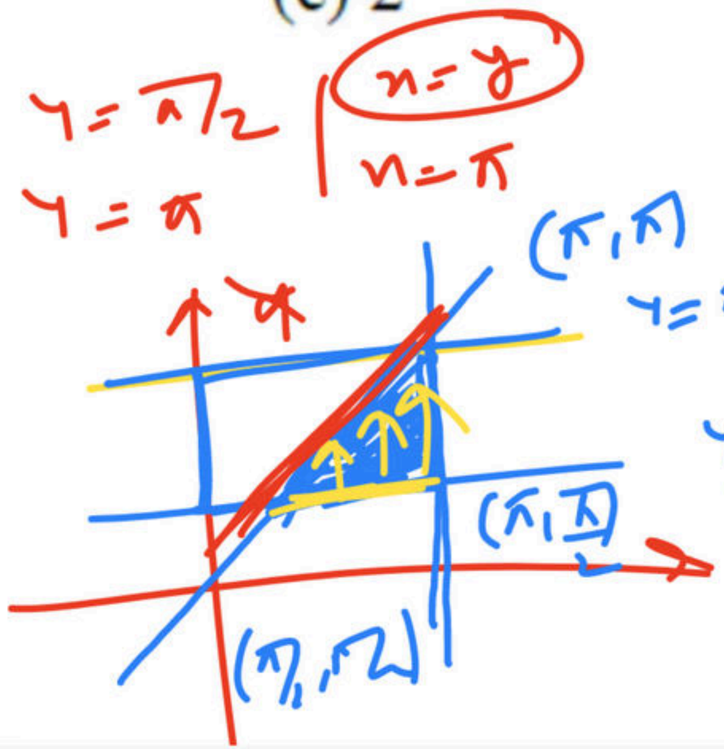
IIT-JAM-2007

(a) 0

(b) 1

(c) 2

(d) 3



$$= -(\cos x)_{\pi/2}^{\pi} = -(\cos\pi - \cos\pi/2)$$

Q3. Change the order of integration in $\int_{-1}^{2}\int_{-x}^{2-x^2} f(x,y)\,dy\,dx$.

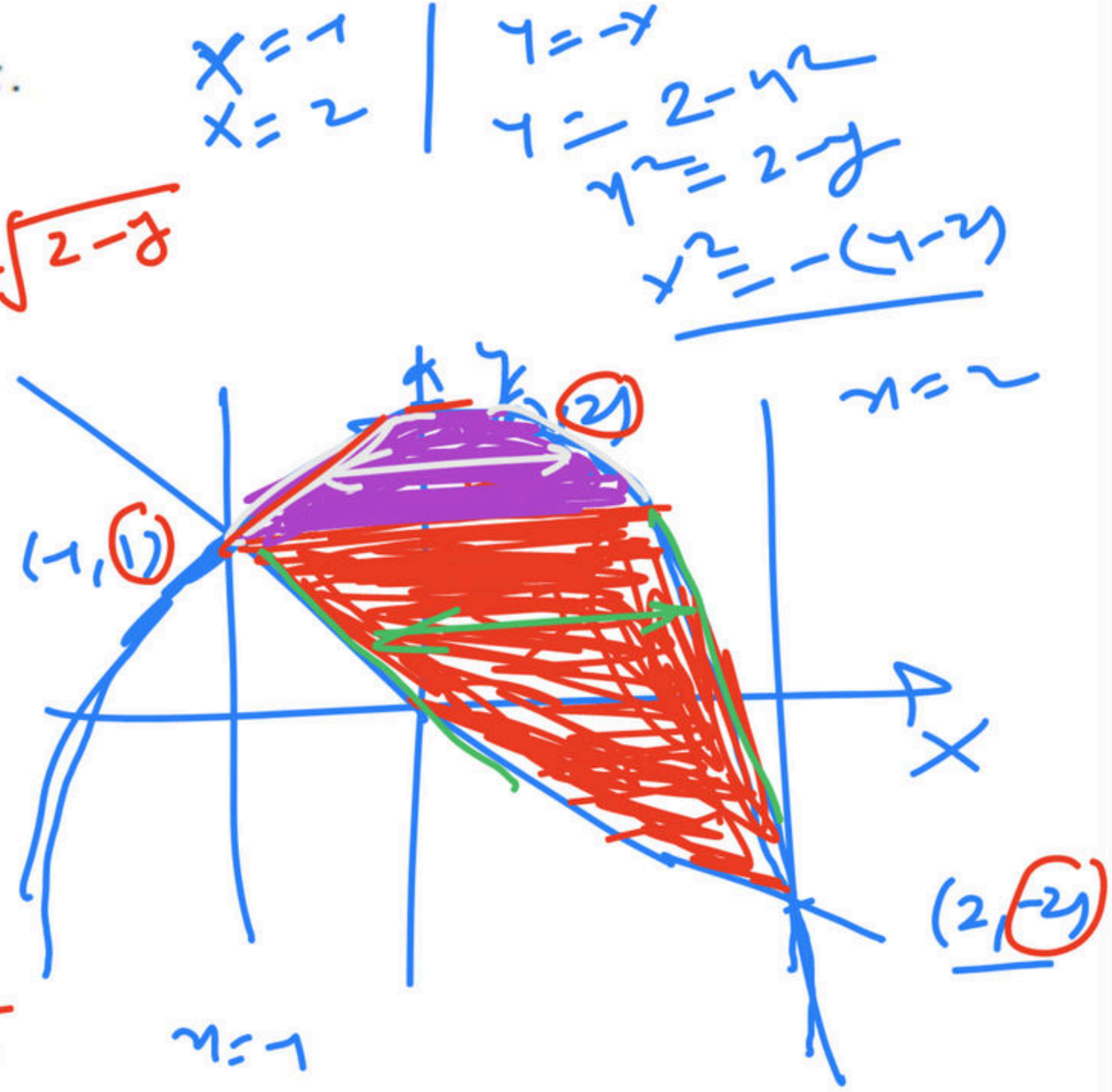
IIT-JAM – 2010

(a) $\int_{-1}^{2}\int_{-\sqrt{2-y}}^{\sqrt{2-y}} f(x,y)\,dx\,dy - \int_{-2}^{1}\int_{-y}^{\sqrt{2-y}} f(x,y)\,dx\,dy$

(b) $\int_{1}^{2}\int_{-\sqrt{2-y}}^{\sqrt{2-y}} f(x,y)\,dx\,dy + \int_{0}^{1}\int_{-y}^{\sqrt{2-y}} f(x,y)\,dx\,dy$

(c) $\int_{1}^{2}\int_{-\sqrt{2-y}}^{\sqrt{2-y}} f(x,y)\,dx\,dy + \int_{-2}^{1}\int_{-y}^{\sqrt{2-y}} f(x,y)\,dx\,dy$

(d) None of these



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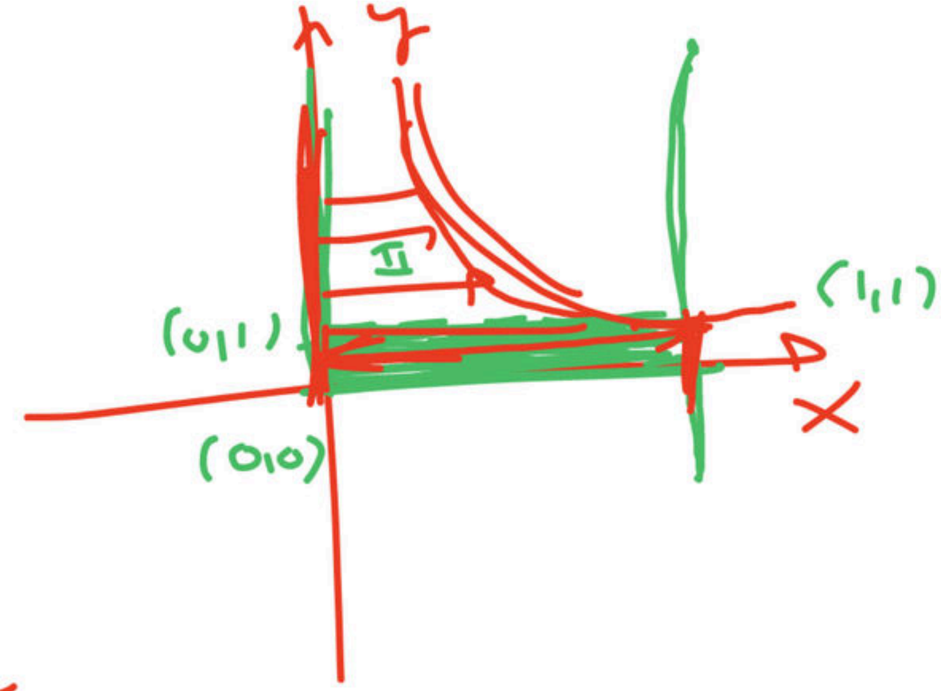
Q4. Change the order of $\int_0^1 \int_0^{1/x} \frac{y}{(1+xy)^2(1+y^2)}\,dydx$

(a) $\int_0^1 \int_0^{\infty} \frac{y}{(1+xy)^2(1+y^2)}\,dxdy + \int_1^{\infty} \int_0^{1/y} \frac{-y}{(1+xy)^2(1+y^2)}\,dxdy$

(b) $\int_0^1 \int_0^1 \frac{y}{(1+xy)^2(1+y^2)}\,dxdy + \int_1^{\infty} \int_0^{1/y} \frac{y}{(1+xy)^2(1+y^2)}\,dxdy$

(c) $\int_0^1 \int_0^1 \frac{y}{(1+xy)^2(1+y^2)}\,dxdy - \int_1^{\infty} \int_0^{1/y} \frac{y}{(1+xy)^2(1+y^2)}\,dxdy$

(d) None of these



Q5. Change the order of integration in $\int_0^{2a}\int_{x^2/4a}^{3a-x} f(x,y)dydx$.

(a) $I=\int_0^a\int_0^{\sqrt{4ay}} f(x,y)dxdy+\int_a^{3a}\int_0^{3a-y} f(x,y)dxdy$

(b) $I=\int_0^a\int_0^{\sqrt{4ay}} f(x,y)dxdy-\int_a^{3a}\int_0^{3a-y} f(x,y)dxdy$

(c) $I=\int_0^a\int_0^{a-y} f(x,y)dxdy+\int_a^{3a}\int_0^{3a-y} f(x,y)dxdy$

(d) None of these

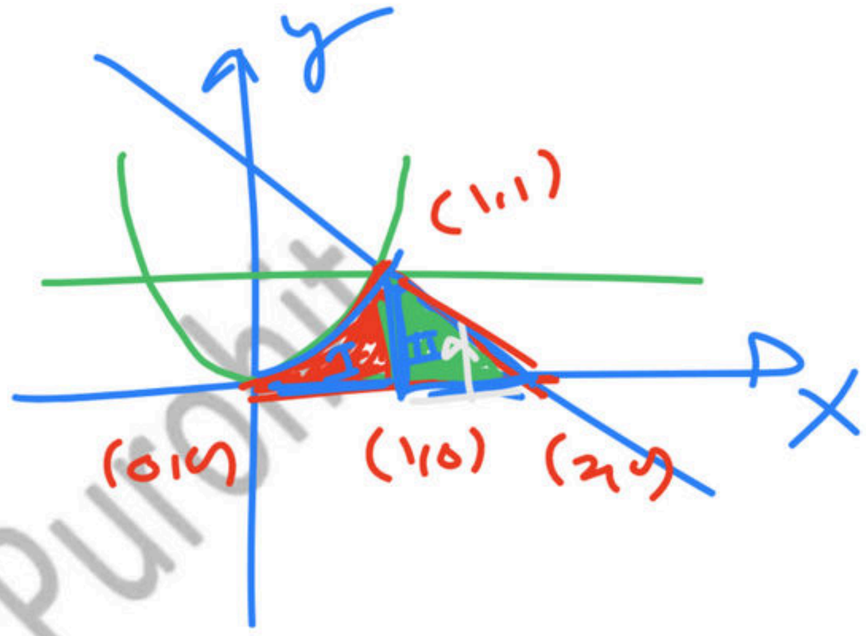
Q6 Change the order of double integration $I = \int_0^1 \int_{\sqrt{y}}^{2-y} f\,dx\,dy$

(a) $I = \int_0^1 \int_0^{x^2} f\,dy\,dx - \int_1^2 \int_0^{2-x} f\,dy\,dx$

(b) $I = \int_0^1 \int_0^{x^2} f\,dy\,dx + \int_1^2 \int_0^{2-x} f\,dy\,dx$

(c) $I = \int_0^1 \int_0^{x^2} f\,dy\,dx + \int_0^{x^2} \int_0^{2-x} f\,dy\,dx$

(d) None of these



Q7. Change the order of integration in the double integral

$$\int_{-1}^{2}\left(\int_{-x}^{2-x^2} f(x,y)\,dy\right)dx$$ **IIT-JAM – 2011**

(a) $I=\int_{-2}^{1}\left(\int_{-y}^{\sqrt{2-y}} f(x,y)\,dx\right)dy-\int_{1}^{2}\left(\int_{-\sqrt{2-y}}^{\sqrt{2-y}} f(x,y)\,dx\right)dy$

(b) $I=\int_{-2}^{1}\left(\int_{-y}^{\sqrt{2-y}} f(x,y)\,dx\right)dy+\int_{1}^{2}\left(\int_{-\sqrt{2-y}}^{\sqrt{2-y}} f(x,y)\,dx\right)dy$

(c) $I=\int_{0}^{1}\left(\int_{-y}^{\sqrt{2+y}} f(x,y)\,dx\right)dy+\int_{0}^{2}\left(\int_{-\sqrt{2-y}}^{\sqrt{2-y}} f(x,y)\,dx\right)dy$

(d) None of these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