

#1

$$\int \frac{1+4x}{\sqrt{1+x+2x^2}} dx$$

$$\text{Let } u = 1+x+2x^2 \\ du = (1+4x) dx$$

$$\int \frac{1}{\sqrt{u}} du = \int u^{-1/2} du$$

$$= 2u^{1/2} + C = 2\sqrt{1+x+2x^2} + C$$

#2

$$\int \frac{\cos \sqrt{x}}{\sqrt{x}} dx$$

$$\text{Let } u = \sqrt{x} = x^{1/2}$$

$$du = \frac{1}{2} x^{-1/2} dx$$

$$= \frac{1}{2} \frac{1}{\sqrt{x}} dx$$

$$2du = \frac{1}{\sqrt{x}} dx$$

$$2 \int \cos u du = 2 \sin u + C$$

$$= 2 \sin \sqrt{x} + C$$

#3

$$\int_0^1 x^2 (1+2x^3)^5 dx$$

$$\text{Let } u = 1+2x^3$$

$$u = 1+2x^3$$

$$du = 6x^2 dx$$

$$x=1$$

$$u=3$$

$$\frac{1}{6} du = x^2 dx$$

$$x=0$$

$$u=1$$

$$\begin{aligned} \frac{1}{6} \int_1^3 u^5 du &= \frac{1}{36} u^6 \Big|_1^3 \\ &= \frac{1}{36} 3^6 - \frac{1}{36} \end{aligned}$$

#4

$$\int_0^{\pi/3} \frac{\sin x}{\cos^2 x} dx$$

$$\text{Let } u = \cos x$$

$$u = \cos x$$

$$du = -\sin x dx$$

$$x = \pi/3$$

$$u = 1/2$$

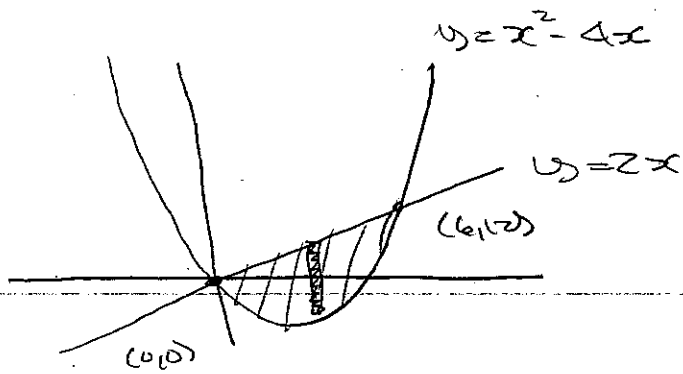
$$-du = \sin x dx$$

$$x=0$$

$$u=1$$

$$\begin{aligned} - \int_1^{1/2} \frac{1}{u^2} du &= - \int_1^{1/2} u^{-2} du \\ &= u^{-1} \Big|_1^{1/2} = \frac{1}{u} \Big|_1^{1/2} = 2 - 1 = 1 \end{aligned}$$

#5



$$x^2 - 4x = y = 2x$$

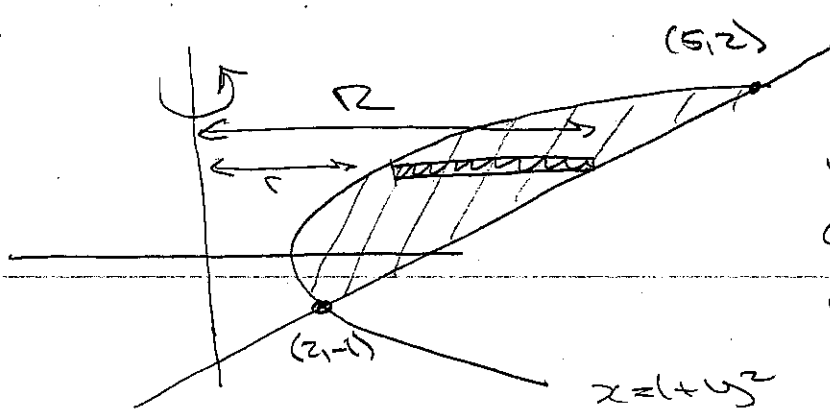
$$x^2 - 6x = 0$$

$$x(x - 6) = 0$$

$$x = 0 \quad x = 6$$

$$\int_0^6 [2x - (x^2 - 4x)] dx$$

#6



$$\begin{aligned}y &= x - 3 \\x &= y + 3 \\y + 3 &= x = 1 + y^2 \\0 &= y^2 - y - 2 \\0 &= (y - 2)(y + 1) \\y &= 2, y = -1\end{aligned}$$

washen

$$\int_{-1}^2 \pi (R^2 - r^2) \text{ thickness}$$
$$\int_{-1}^2 \pi [(y+3)^2 - (1+y^2)^2] dy$$