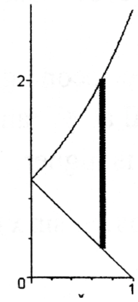
Area $= \int_0^1 (e^x - (1-x))dx = \left(e^x - x + \tfrac{1}{2}x^2\right)\Big|_0^1 = e - \tfrac{3}{2}$

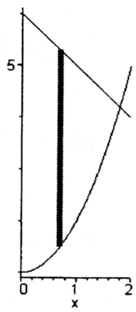


3.

$-x+6 = x^2+1 \Rightarrow x^2+x-5=0 \Rightarrow x = \dfrac{-1\pm\sqrt{1-4(-5)}}{2} = \dfrac{-1\pm\sqrt{21}}{2}$

Area

$= \int_0^{\frac{-1+\sqrt{21}}{2}} ((-x+6)-(x^2+1))dx = \left(-\tfrac{1}{3}x^3 - \tfrac{1}{2}x^2 + 5x\right)\Big|_0^{\frac{-1+\sqrt{21}}{2}} \approx 5.436$



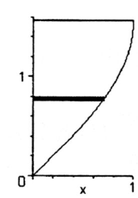
Then $100000\Delta t$ will be the amount of the stream during that interval so its present value will be $PV_i = 100000\Delta t / e^{0.05t_i}$, hence the total $PV = \sum_{i=1}^{n} 100000\Delta t / e^{0.05t_i} = \sum_{i=1}^{n}\left(100000 / e^{0.05t_i}\right)\Delta t$

In the limit, taking smaller and smaller subintervals, this sum approaches the integral

$$\int_0^{20} 100000 / e^{0.05t}\, dt = \int_0^{20} 100000e^{-0.05t}\, dt = -\tfrac{100000}{0.05} e^{-0.05t}\Big|_0^{20} = 2000000(1-e^{-1}) \approx \$1264241$$

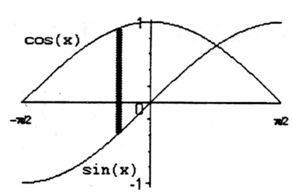
5. $y = \arcsin x \Leftrightarrow x = \sin y$

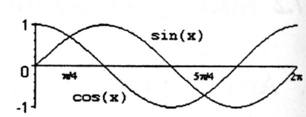
Area $= \int_0^{\pi/2} \sin y\, dy = (-\cos y)\Big|_0^{\pi/2} = -\cos(\pi/2) + \cos(0) = 1$



6. (a) From the first graph we get the area

$= \int_{-\pi/4}^{\pi/4} (\cos x - \sin x)dx$





(b) See the second graph. We need to split the interval at $\pi/4$ and at $5\pi/4$ as the functions trade which is higher. The combined area will be

$$\int_0^{\pi/4}(\cos x - \sin x)dx + \int_{\pi/4}^{5\pi/4}(\sin x - \cos x)dx + \int_{5\pi/4}^{2\pi}(\cos x - \sin x)dx$$