5. Evaluate $\int_C (x+2)\,ds$ where $C$ is $r(t) = t\,i + \frac{4}{3}t^{\frac{3}{2}}\,j + \frac{1}{2}t^2 k$ and $0 \le t \le 2$

$r(t) = [t, \frac{4}{3}t^{\frac{3}{2}}, \frac{1}{2}t^2]$

find $r'(t) = [1, 2t^{\frac{1}{2}}, t]$

~~find~~ $|r'(t)| = \cancel{\sqrt{1^2 + 4t + t^2}} = \sqrt{t^2 + 4t + 1}$

Find vector field as function of $r(t) = F(r(t)) = t + 2$

Setup integral

$$\int_C f(x,y)\,ds = \int_0^2 F(r(t)) \cdot r'(t)$$

$$= \int_0^2 [t+2, 0, 0] \cdot [1, 2t^{\frac{1}{2}}, t]\,dt$$

$$= \int_0^2 t\,dt = \frac{1}{2}t^2 \Big|_0^2 = \boxed{2}$$

6) Find square roots of $1 - \sqrt{3}i$ expressed in rect coordinates

rect form = $a + bi$

polar form = $r\cos\theta + i\,r\sin\theta$ where $r = \sqrt{a^2+b^2}$ and $\tan^{-1}\frac{b}{a} = \theta$

De Moivre's: $z^n = (r^n(\cos n\theta + i\sin n\theta))$

so in polar form: $z = 1 - \sqrt{3}i$

$|z| = \sqrt{1^2 + -\sqrt{3}^2} = 2$ $\quad \tan\theta = \frac{-\sqrt{3}}{1} = -60°$

let $z^2 = 2e^{i\frac{-\pi}{3}}$ so $z = \sqrt{2}e^{i\frac{-\pi}{6}}$

so $1 - \sqrt{3}i = \sqrt{2}(\cos -\frac{\pi}{6} + i\sin(-\frac{\pi}{6})) = \sqrt{2}(\frac{\sqrt{3}}{2} - \frac{1}{2}i)$

$= \frac{1}{\sqrt{2}}(\sqrt{3} - i)$ so $\boxed{z \text{ is } \pm\frac{1}{\sqrt{2}}(\sqrt{3} - i)}$ so $\pm\frac{\sqrt{3}}{\sqrt{2}} - \frac{i}{\sqrt{2}}$