Find the arc length of the curve

$$\mathbf{r}(t) = \cos t \,\mathbf{i} + \sin t \,\mathbf{j} + \frac{2}{3}t^{3/2} \,\mathbf{k}$$

from t = 0 to $t = 4\pi$.

$$F'(t) = (-\sin t)t + (\cos t) + (t''^2) = 1$$

$$= \sqrt{1+t}$$

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$$= \cot |\cos t| = \int_{0}^{t} \sqrt{1+t} dt$$

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$$= \left[\frac{2}{3} \sqrt{3}\right]_{1}^{2} - 1$$

$$= \frac{2}{3} \left[(4\pi + 1)^{3/2} - 1 \right]$$

$$\approx 32.65$$