1. Evaluate:

a) $\int_1^2 \left(x^2 + \frac{1}{x}\right) dx = \left(\frac{x^3}{3} + \ln|x|\right)\Big|_1^2$

$= \frac{(2)^3}{3} + \ln|2| - \left(\frac{(1)^3}{3} + \underbrace{\ln|1|}_{=0}\right)$

$= \frac{8}{3} + \ln 2 - \frac{1}{3}$

$= \boxed{\frac{7}{3} + \ln 2}$

≈ 3.026

b) $\int_0^1 \frac{3x^2}{(x^3+1)^2}\, dx$

$u = x^3 + 1$

$du = 3x^2 dx$

$\frac{du}{3x^2} = dx$

$x=0: \ u = (0)^3 + 1 = 1$

$x=1: \ u = (1)^3 + 1 = 2$

$= \int_{u=1}^{u=2} \frac{\cancel{3x^2}}{u^2} \cdot \frac{du}{\cancel{3x^2}}$

$= \int_1^2 u^{-2} du$

$= \left(\frac{u^{-1}}{-1}\right)\Big|_1^2$

$\frac{u^{-1}}{-1} = \frac{-u^{-1}}{1} = -u^{-1} = -\frac{1}{u}$

$= \left(\frac{-1}{u}\right)\Big|_1^2$

$= \frac{-1}{2} - \left(\frac{-1}{1}\right)$

$= \boxed{\frac{1}{2}}$

Q: What is harder to catch the faster you run?