

Properties of the Natural Logarithm Function

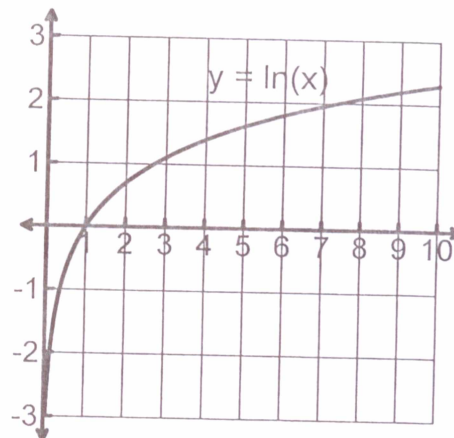
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The graph of $y = \ln(x)$ is shown in the coordinate plane to the right.

Some of the properties of $y = \ln(x)$:

1. $\ln(1) = 0$
2. $\ln(ab) = \ln(a) + \ln(b)$
3. $\ln(a^n) = n \cdot \ln(a)$
4. $\ln \frac{a}{b} = \ln(a) - \ln(b)$
5. $e^{(\ln(x))} = x$



1. $\int \frac{x^2}{2+x^3} dx$ $U = 2+x^3$
 $dU = 3x^2 dx$
 $dx = \frac{dU}{3x^2}$

$$\int \frac{\cancel{x^2}}{U} \frac{dU}{3\cancel{x^2}} = \frac{1}{3} \int \frac{dU}{U} = \ln|U| + C = \ln|2+x^3| + C$$

2. $\int \frac{4}{2-x} dx$ $U = 2-x$
 $dU = -dx$
 $dx = -dU$

$$\begin{aligned} &= \int \frac{4}{U} (-dU) = -4 \int \frac{dU}{U} = \cancel{4} -4 \ln|U| + C \\ &= -4 \ln|2-x| + C \end{aligned}$$