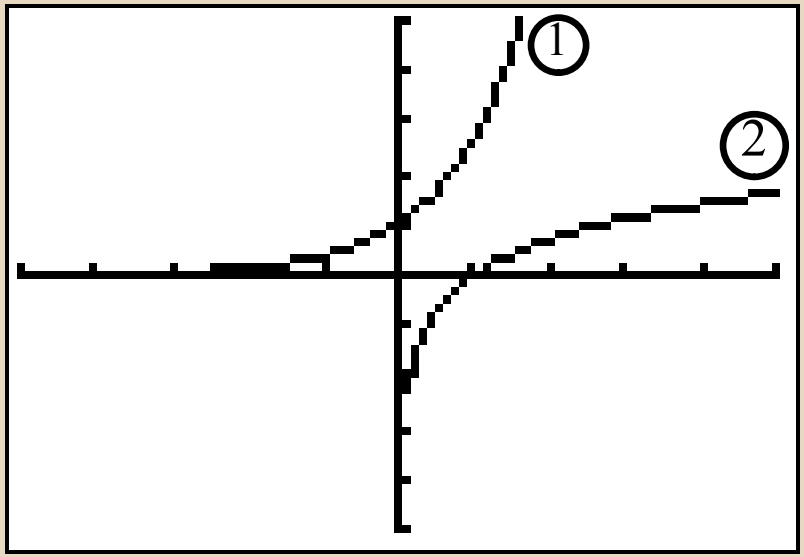
Algebra 2
Ch. 8 Handout 8.6

Natural Logarithms

Natural Logarithmic Function

If $y = e^x$, then $\log_e y = x$, which is commonly written as $\ln y = x$.



① $y = e^x$

② $y = \ln x$

Write as a single natural logarithm.

1) $2\ln 12 - \ln 9$

$\ln 12^2 - \ln 9$

$\ln 144 = \ln 9$

$\ln \frac{144}{9}$

$\ln 16$

2) $5\ln 2 - \ln 4$

$\ln 2^5 - \ln 4$

$\ln 32 = \ln 4$

$\ln \frac{32}{4}$

$\ln 8$

Write as a single natural logarithm.

3) $3\ln x + \ln y$

$\ln x^3 + \ln y$

$\ln x^3 y$

4) $\frac{1}{4}\ln 3 + \frac{1}{4}\ln x$

$\ln 3^{\frac{1}{4}} + \ln x^{\frac{1}{4}}$

$\ln \sqrt[4]{3} + \ln \sqrt[4]{x}$

$\ln \sqrt[4]{3} \cdot \sqrt[4]{x}$

$\ln \sqrt[4]{3x}$

Solve each natural logarithmic equation.

5) $\ln(2x-4)^3 = 6$

$\sqrt[3]{e^6} = \sqrt[3]{(2x-4)^3}$

$e^2 = 2x - 4$

$+4 \qquad +4$

$\frac{e^2+4}{2} = \frac{2x}{2}$

$x = \frac{e^2+4}{2}$

$x \approx 5.6945$

6) $\ln x = 0.1$

$e^{.1} = x$

$x \approx 1.1052$

Solve each natural logarithmic equation.

7) $\ln(3x-9)=21$

$e^{21}=3x-9$

$+9 \quad +9$

$\frac{e^{21}+9}{3}=\frac{3x}{3}$

$x=\frac{(e^{21}+9)}{3}$

$x\approx 439\,605\,247.8$

8) $\ln\left(\frac{x+2}{3}\right)=12$

$3e^{12}=\frac{x+2}{3}\ (3)$

$3e^{12}=x+2$

$-2 \quad -2$

$x=-2+3e^{12}$

$x\approx 488,262.3743$

Use natural logarithms to solve each equation.

9) $4e^{3x} + 1.2 = 14$

$-1.2 \quad -1.2$

$\frac{4e^{3x}}{4} = \frac{12.8}{4}$

$e^{3x} = 3.2$

$\ln e^{3x} = \ln 3.2$

$3x(\ln e) = \ln 3.2$

$3x = \ln 3.2$

$x = \frac{\ln 3.2}{3}$

$x \approx .3877$

10) $e^{x+1} = 30$

$\ln e^{(x+1)} = \ln 30$

$(x+1)(\ln e) = \ln 30$

$x + 1 = \ln 30$

$-1 \quad -1$

$x = -1 + \ln 30$

$x \approx 2.4012$

11) $e^{\frac{2x}{5}} + 7.2 = 9.1$

$-7.2 \quad -7.2$

$e^{\frac{2x}{5}} = 1.9$

$\ln e^{\frac{2x}{5}} = \ln 1.9$

$\frac{2x}{5}(\ln e) = \ln 1.9$

$5\left(\frac{2x}{5}\right) = 5(\ln 1.9)$

$\frac{2x}{2} = \frac{5\ln 1.9}{2}$

$x = \frac{5\ln 1.9}{2}$

$x \approx 1.6046$

Assignment:

pgs 472-475 1-11,14-28,31-38,55-62 skip 60