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Page 308 33-62, not 4's

34. 10,000

38. (b)

42. Starting with $y = \ln x$:
shift up 2 units.

46. Starting from $y = \ln x$:
reflect across the y-axis and
translate right 5 units.

50. Starting from $y = \log x$:
reflect across both axes and
vertically stretch by 3.

54.

Domain: $(-1, \infty)$; Range: $(-\infty, \infty)$; Continuous;
Always increasing; Not symmetric; Not bounded;
No local extrema; Asymptote: $x = -1$; $\lim_{x \to \infty} f(x) = \infty$

58.

Domain: $(-\infty, 2)$; Range: $(-\infty, \infty)$; Continuous;
Always decreasing; Not symmetric;
Not bounded; No local extrema;
Asymptote: $x = 2$; $\lim_{x \to -\infty} x = \infty$

62. $y = -76.721 + 46.715 \ln x$; when $x = 35$, $y \approx 89.37$ metric tons.

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Properties of Logarithms

Let b $(b \neq 1)$, R, and S be positive real numbers and c be any real number.

- Product Rule:
- Quotient Rule:
- Power Rule:

1. Assuming x and y are positive, rewrite the expression as a sum or difference of logarithms or multiples of logarithms.

$$\log \frac{2}{y} \qquad \log xy^3 \qquad \log \frac{\sqrt[3]{x}}{\sqrt[3]{y}}$$

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2. Assuming x, y, and z are positive, rewrite the expression as a single logarithm.

$\ln x - \ln y$ $4\log y - \log z$ $4\ln\left(x^2 y\right) - 5\ln\left(xy^3\right)$

Change of Base Formula for Logarithms

For positive real numbers ***a***, ***b***, and ***x*** with $a \neq 1$ and $b \neq 1$.

$$\log_b x = \frac{\log_a x}{\log_a b}$$

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3. Use *change of base* and a calculator to evaluate.

$\log_5 19$ $\log_{0.2} 29$

4. Rewrite the expressions using natural logarithms.

$\log_5 (c - d)$

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5. Rewrite the expressions using common logarithms.

$$\log_{\frac{1}{3}}\left(x-y\right)$$