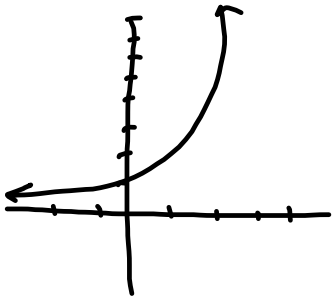
Sec 5.4 Exponential Functions

Exponential Functions – when base is a constant and the exponent is a variable

Such as $y = 2^x$



Rules:

$a^0 = 1$

$a^x \cdot a^y = a^{x+y}$

$\frac{a^x}{a^y} = a^{x-y}$

$(a^x)^y = a^{xy}$

$(ab)^x = a^x b^x$

$\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

$a^{-x} = \frac{1}{a^x}$

Solve for x

$e^{\ln 2x} = 12$

$2x = 12$

$x = 6$

$e^{\ln 4x} = 1$

$4x = 1$

$x = \frac{1}{4}$

$\frac{4e^x}{4} = \frac{83}{4}$

$\ln e^x = \ln \frac{83}{4}$

$x = \ln\left(\frac{83}{4}\right)$

$\frac{2\ln x^2}{2} = \frac{10}{2}$

$e^{\ln x} = e^5$

$x = e^5$

Natural Number e

$e \approx 2.71828\ldots$

e is defined as $e = \lim_{x \to 0} (1+x)^{1/x}$

Derivative

$$\frac{d}{dx} e^x = e^x \qquad \frac{d}{dx} e^u = e^u \cdot u'$$

ex $\frac{d}{dx}\left[e^{2x-1}\right] = e^{2x-1}(2) = 2e^{2x-1}$

$\frac{d}{dx}[x \cdot e^x]$ product rule

$x \cdot \frac{d}{dx}[e^x] + \frac{d}{dx}[x] \cdot e^x$

$xe^x + 1 \cdot e^x$

$xe^x + e^x$

$e^x(x+1)$

Homework page 50 in AP Calculus Problem Book

FIND y' FOR EACH OF THE FOLLOWING.

556. $y = e^{2x}$

557. $y = e^{-3x/2}$

558. $y = x^2 e^x$

559. $y = 5e^{2-x}$

564. $y = \dfrac{e^{5x}}{x^2}$

574. $g(x) = x^3 e^{2x}$

575. $Z(x) = 4e^{4x^2+5}$

576. $q(x) = \ln(e^x + 1)$

577. $f(x) = \dfrac{e^x - 1}{e^x + 1}$