$\ln = \log_e$

$\log = \log_{10}$

3.9

(31) slope m (0,0) tangent to $y = \ln(2x)$

$y = mx + b$, $b = 0$

$y' = \frac{1}{2x}[2] = \boxed{\frac{1}{x} = m}$

$y = \frac{1}{x} \cdot x$

$1 = \ln(2x)$

$y = 1$

$e^{1} = e^{\ln(2x)}$

$1 = \ln(2x)$

$\frac{e}{2} = \frac{2x}{2}$

$\frac{2}{e} = m$

$\frac{e}{2} = x$

(49) $y = e^x$ (0,0) $\rightarrow$ $y = mx + b$, $b = 0$

$y = mx$

$y' = e^x = m = e^1 = e$

~~$y'(0) = e^0 = 1 = m$~~

$y = e^x x = e^x$

$e^x x = e^x$

$x = 1$

$y = e^1 = e$ (1, e)

$\boxed{y = ex}$

(25) $y = \ln 2 \cdot \log_2 x$

$y' = \cancel{\ln 2} \cdot \frac{1}{x \cancel{\ln 2}} = \boxed{\frac{1}{x}}$

(45) $y = \sqrt[5]{\frac{(x-3)^4(x^2+1)}{(2x+5)^3}}$

$\ln y = \ln\left(\frac{(x-3)^4(x^2+1)}{(2x+5)^3}\right)^{1/5}$

$\ln y = \frac{1}{5}\ln\left(\frac{(x-3)^4(x^2+1)}{(2x+5)^3}\right)$

3.9

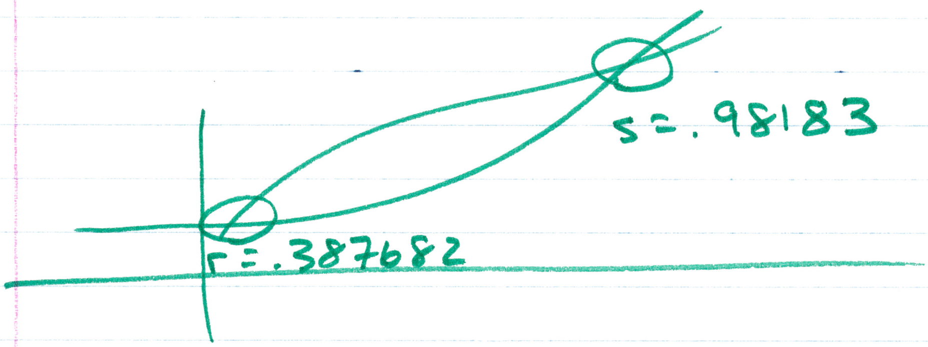
45 cont. $\ln y = \frac{1}{5}\left[\ln (x-3)^4 (x^2+1) - \ln (2x+5)^3\right]$

$$\ln y = \frac{1}{5}\left[\ln (x-3)^4 + \ln (x^2+1) - \ln (2x+5)^3\right]$$

$$\ln y = \frac{1}{5}\left[4\ln (x-3) + \ln (x^2+1) - 3\ln (2x+5)\right]$$

$$y \cdot \frac{1}{y}\frac{dy}{dx} = \frac{1}{5}\left[\frac{4}{x-3} + \frac{2x}{x^2+1} - \frac{6}{2x+5}\right] \cdot y$$

$$\frac{dy}{dx} = \frac{1}{5}\left[\frac{4}{x-3} + \frac{2x}{x^2+1} - \frac{6}{2x+5}\right]\sqrt{\text{crap}}$$



3.9

(45) $\ln y = \ln \sqrt[5]{\frac{(x-3)^4(x^2+1)}{(2x+5)^3}} = \ln\left(\frac{(x-3)^4(x^2+1)}{(2x+5)^3}\right)^{1/5}$

$\ln y = \frac{1}{5}\ln \frac{(x-3)^4(x^2+1)}{(2x+5)^3}$

$\ln y = \frac{1}{5}\left[\ln (x-3)^4(x^2+1) - \ln(2x+5)^3\right]$

$\ln y = \frac{1}{5}\left[\ln(x-3)^4 + \ln(x^2+1) - \ln(2x+5)^3\right]$

$\ln y = \frac{1}{5}\left[4\ln(x-3) + \ln(x^2+1) - 3\ln(2x+5)\right]$

$\cancel{y}\cdot \cancel{\frac{1}{y}}\frac{dy}{dx} = \frac{1}{5}\left[\frac{4}{x-3} + \frac{2x}{x^2+1} - \frac{6}{2x+5}\right]\cdot y$

$\frac{dy}{dx} = \left[\frac{4}{5}\cdot\frac{1}{(x-3)} + \frac{2x}{5(x^2+1)} - \frac{6}{5(2x+5)}\right]\sqrt[5]{\text{crap}}$

(50) $y = xe^{x}$, $(0,0)$

$y' = e^x + xe^x$

$y'(0) = e^0 + \cancel{0e^0}$

$y'(0) = 1$ $\quad m = -1$

$\boxed{y = -x}$

(53) $A = 20\cdot\left(\frac{1}{2}\right)^{\frac{1}{140}t}$

$A' = 20\cdot\left(\frac{1}{2}\right)^{\frac{1}{140}t}\ln\left(\frac{1}{2}\right)\left[\frac{1}{140}\right]$

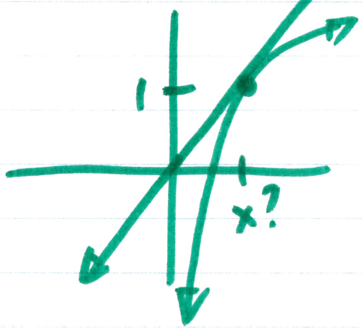
$A' = 20\left(\frac{1}{2}\right)^{\frac{1}{140}\cdot 2}\left(\ln\frac{1}{2}\right)\left[\frac{1}{140}\right]$

$= 20\left(\frac{1}{2}\right)^{\frac{1}{70}}\left(\ln\frac{1}{2}\right)\left[\frac{1}{140}\right]$

$\boxed{= \frac{1}{7}\left(\frac{1}{2}\right)^{\frac{1}{70}}\left(\ln\frac{1}{2}\right)}$

3.9

31



$y = mx$

$m = \frac{y}{x} = \frac{1}{x}$

$y = 1$

$y = \ln(2x)$

$y' = \frac{1}{2x}[2] = \frac{1}{x}$

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

$1 = \ln(2x)$

$e^1 = e^{\ln(2x)}$

$\frac{e}{2} = \frac{2x}{2}$

$\frac{e}{2} = x$

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