1. (a) $y = 3\log_5 \sqrt{x^2-5}$

$y' = 3 \cdot \frac{1}{(x^2-5)^{1/2} \ln 5} \cdot \frac{1}{2}(x^2-5)^{-1/2} \cdot 2x$

(b) $y = 6^{(x^2-2x)}$

$y' = 6^{(x^2-2x)} \cdot \ln 6 \cdot (2x-2)$

(c) $h(x) = \frac{5^{\tan x}}{\ln(3x^4+5)}$

$h'(x) = \frac{\ln(3x^4+5) \cdot 5^{\tan x} \cdot \ln 5 \cdot \sec^2 x - 5^{\tan x} \cdot \frac{1}{3x^4+5} \cdot 12x^3}{[\ln(3x^4+5)]^2}$

(d) $y = e^{\sec(2x) \cdot \ln(3x^{-4})}$

$y' = e^{\sec(2x)} \cdot \frac{1}{3x^{-4}}(-12x^{-5}) + \ln(3x^{-4}) e^{\sec 2x} \cdot \sec(2x)\tan(2x) \cdot 2$

(e) $y = \ln 4x^7 - (\ln 4x)^7 - 7^{4x}$

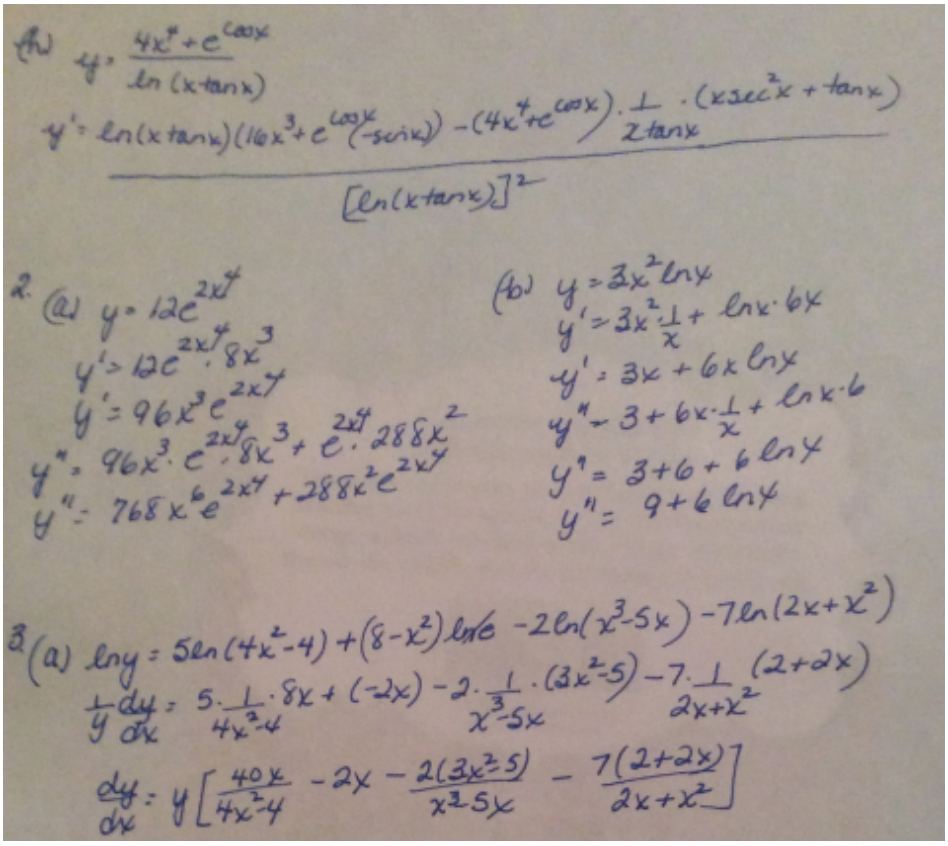
$y' = \frac{1}{4x^7} \cdot 28x^6 - 7(\ln 4x)^6 \frac{1}{4x} \cdot 4 - 7^{4x} \cdot \ln 7 \cdot 4$

(f) $y = \ln(\ln(x^5-1))$

$y' = \frac{1}{\ln(x^5-1)} \cdot \frac{1}{(x^5-1)} \cdot 5x^4$

(g) $y = (5e^{2\sqrt{x}} - 6\ln x)^{-5}$

$y' = -5(5e^{2\sqrt{x}} - 6\ln x)^{-6} \cdot (5e^{2\sqrt{x}} \cdot x^{-1/2} \cdot 6 \cdot \frac{1}{x})$



(h) $y = \dfrac{4x^4 + e^{\cos x}}{\ln(x\tan x)}$

$y' = \dfrac{\ln(x\tan x)(16x^3 + e^{\cos x}(-\sin x)) - (4x^4 + e^{\cos x}) \cdot \frac{1}{2\tan x} \cdot (x\sec^2 x + \tan x)}{[\ln(x\tan x)]^2}$

2. (a) $y = 12e^{2x^4}$

$y' = 12e^{2x^4} \cdot 8x^3$

$y' = 96x^3 e^{2x^4}$

$y'' = 96x^3 \cdot e^{2x^4} \cdot 8x^3 + e^{2x^4} \cdot 288x^2$

$y'' = 768x^6 e^{2x^4} + 288x^2 e^{2x^4}$

(b) $y = 3x^2 \ln x$

$y' = 3x^2 \cdot \frac{1}{x} + \ln x \cdot 6x$

$y' = 3x + 6x \ln x$

$y'' = 3 + 6x \cdot \frac{1}{x} + \ln x \cdot 6$

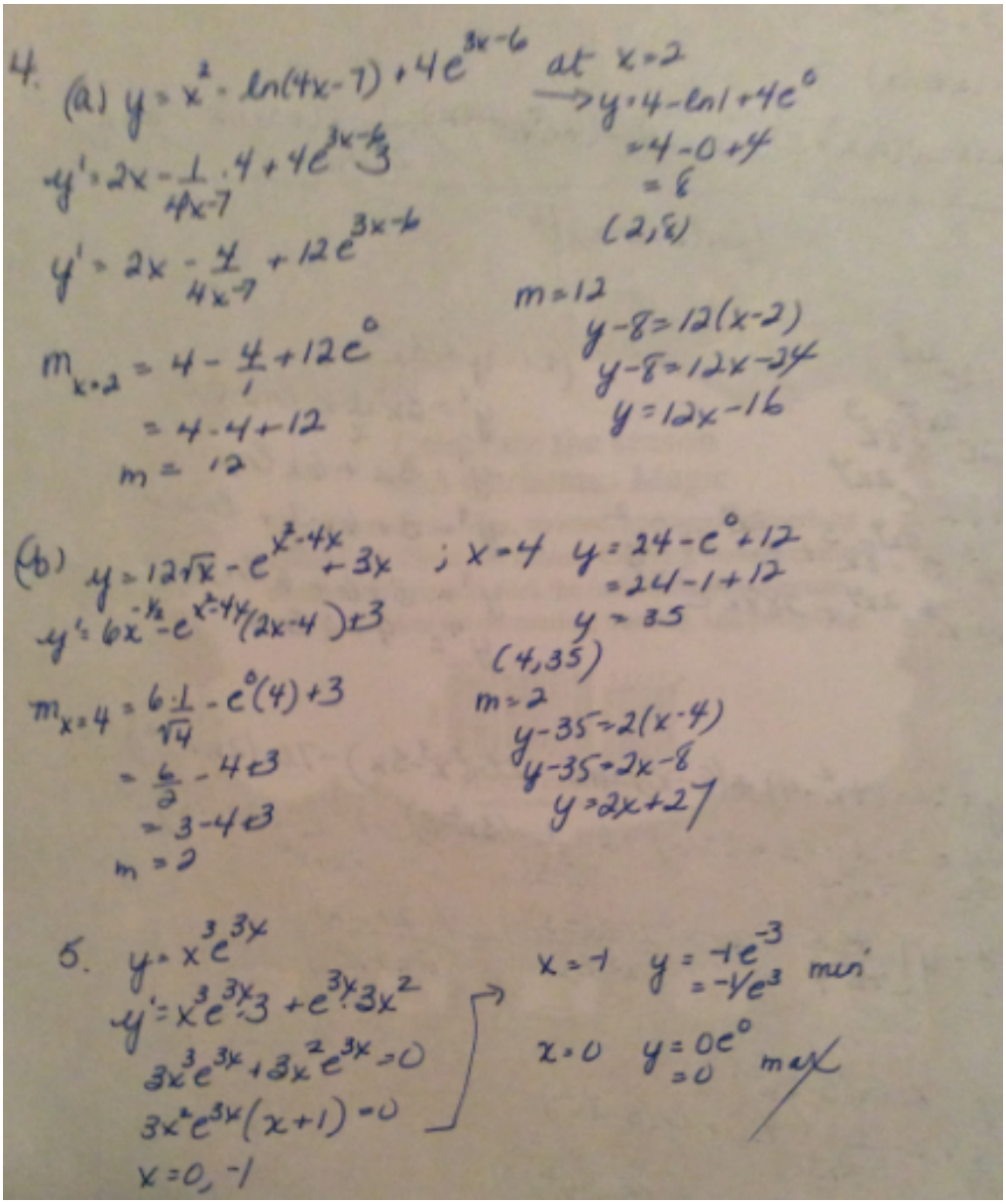
$y'' = 3 + 6 + 6\ln x$

$y'' = 9 + 6\ln x$

3 (a) $\ln y = 5\ln(4x^2 - 4) + (8 - x^2)\ln e - 2\ln(x^3 - 5x) - 7\ln(2x + x^2)$

$\frac{1}{y}\frac{dy}{dx} = 5 \cdot \frac{1}{4x^2 - 4} \cdot 8x + (-2x) - 2 \cdot \frac{1}{x^3 - 5x} \cdot (3x^2 - 5) - 7 \cdot \frac{1}{2x + x^2}(2 + 2x)$

$\frac{dy}{dx} = y\left[\frac{40x}{4x^2 - 4} - 2x - \frac{2(3x^2 - 5)}{x^3 - 5x} - \frac{7(2 + 2x)}{2x + x^2}\right]$



4. (a) $y = x^2 - \ln(4x-7) + 4e^{3x-6}$ at $x=2$

$y' = 2x - \frac{1}{4x-7} \cdot 4 + 4e^{3x-6} \cdot 3$

$y' = 2x - \frac{4}{4x-7} + 12e^{3x-6}$

$m_{x=2} = 4 - \frac{4}{1} + 12e^0$

$= 4 - 4 + 12$

$m = 12$

$\rightarrow y = 4 - \ln 1 + 4e^0$

$= 4 - 0 + 4$

$= 8$

$(2, 8)$

$m = 12$

$y - 8 = 12(x-2)$

$y - 8 = 12x - 24$

$y = 12x - 16$

(b) $y = 12\sqrt{x} - e^{x^2-4x} + 3x$; $x = 4$

$y' = 6x^{-\frac{1}{2}} - e^{x^2-4x}(2x-4) + 3$

$m_{x=4} = 6 \cdot \frac{1}{\sqrt{4}} - e^0(4) + 3$

$= \frac{6}{2} - 4 + 3$

$= 3 - 4 + 3$

$m = 2$

$y = 24 - e^0 + 12$

$= 24 - 1 + 12$

$y = 35$

$(4, 35)$

$m = 2$

$y - 35 = 2(x-4)$

$y - 35 = 2x - 8$

$y = 2x + 27$

5. $y = x^3 e^{3x}$

$y' = x^3 e^{3x} \cdot 3 + e^{3x} \cdot 3x^2$

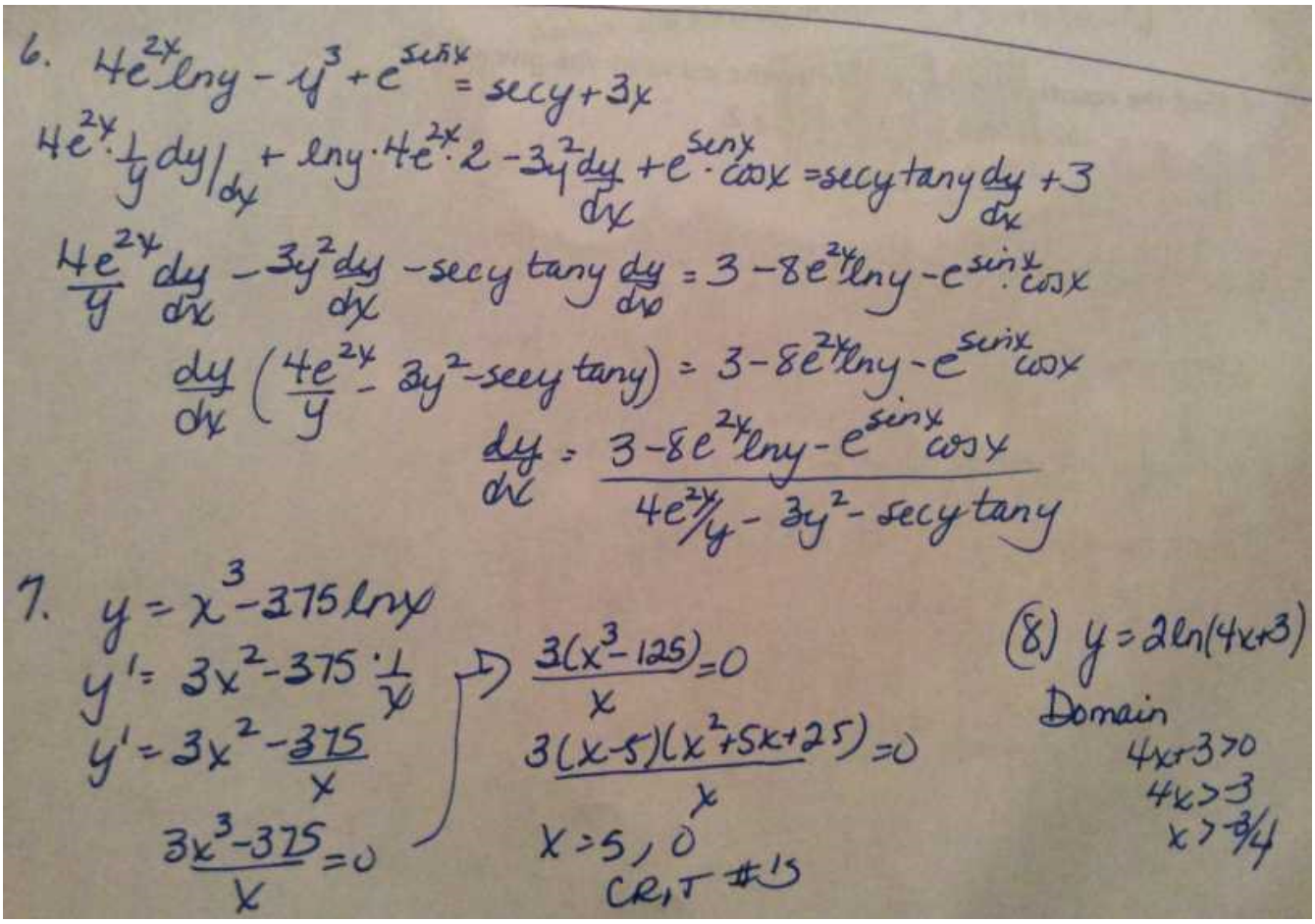
$3x^3 e^{3x} + 3x^2 e^{3x} = 0$

$3x^2 e^{3x}(x+1) = 0$

$x = 0, -1$

$x = -1$ $y = -1e^{-3}$ $= -\frac{1}{e^3}$ min

$x = 0$ $y = 0e^0$ $= 0$ max



6. $4e^{2x}\ln y - y^3 + e^{\sin x} = \sec y + 3x$

$4e^{2x}\cdot\frac{1}{y}\frac{dy}{dx} + \ln y \cdot 4e^{2x}\cdot 2 - 3y^2\frac{dy}{dx} + e^{\sin x}\cdot\cos x = \sec y\tan y\frac{dy}{dx} + 3$

$\frac{4e^{2x}}{y}\frac{dy}{dx} - 3y^2\frac{dy}{dx} - \sec y\tan y\frac{dy}{dx} = 3 - 8e^{2x}\ln y - e^{\sin x}\cdot\cos x$

$\frac{dy}{dx}\left(\frac{4e^{2x}}{y} - 3y^2 - \sec y\tan y\right) = 3 - 8e^{2x}\ln y - e^{\sin x}\cos x$

$\frac{dy}{dx} = \frac{3 - 8e^{2x}\ln y - e^{\sin x}\cos x}{4e^{2x}/y - 3y^2 - \sec y\tan y}$

7. $y = x^3 - 375\ln x$

$y' = 3x^2 - 375\cdot\frac{1}{x}$

$y' = 3x^2 - \frac{375}{x}$

$\frac{3x^3 - 375}{x} = 0$

$\frac{3(x^3 - 125)}{x} = 0$

$\frac{3(x-5)(x^2+5x+25)}{x} = 0$

$x = 5, 0$

CR, T #13

(8) $y = 2\ln(4x+3)$

Domain

$4x+3 > 0$

$4x > -3$

$x > -3/4$