1. (a) $y = \ln(4x^3 - 2x + 1)$

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

(b). $y = \dfrac{\ln(\sin x)}{x^5}$

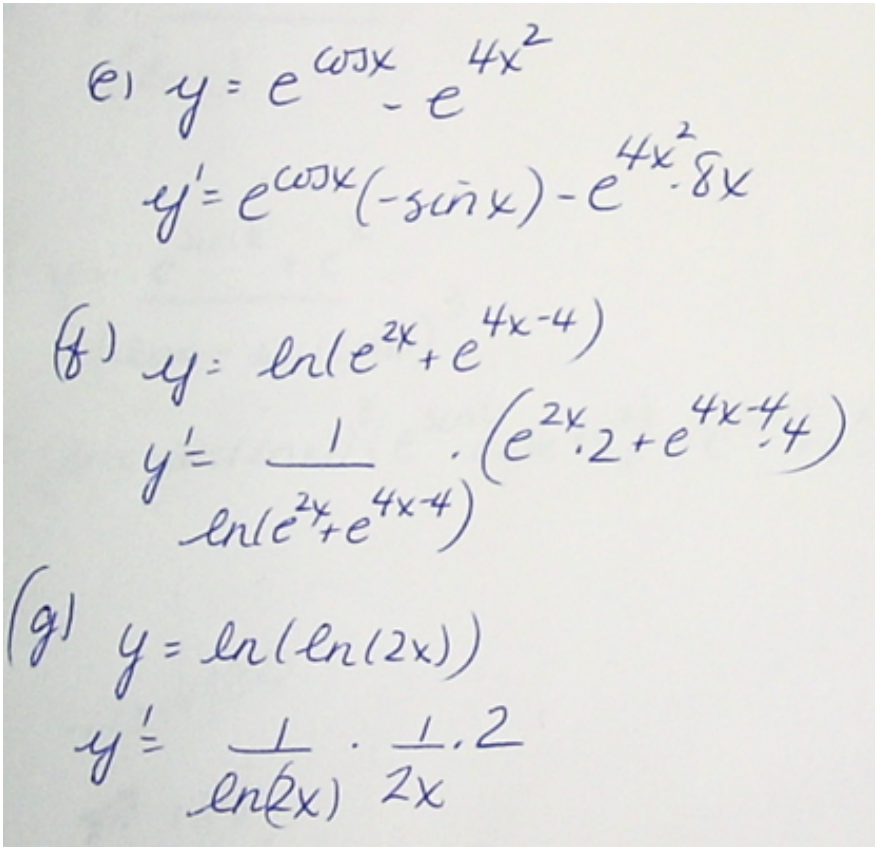
$$y' = \frac{x^5 \cdot \frac{1}{\sin x} \cdot \cos x - \ln(\sin x) \cdot 5x^4}{x^{10}}$$

(c) $y = e^{\sqrt{2x-1}} \cdot \ln(x^{-3})$

$$y' = e^{\sqrt{2x-1}} \cdot \frac{1}{x^{-3}} \cdot (-3x^{-4}) + \ln(x^{-3})\, e^{\sqrt{2x-1}} \cdot \frac{1}{2}(2x-1)^{-\frac{1}{2}} \cdot 2$$

(d) $y = \ln x^3 - (\ln x)^3$

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


e) $y = e^{\cos x} - e^{4x^2}$
$y' = e^{\cos x}(-\sin x) - e^{4x^2} \cdot 8x$
f) $y = \ln(e^{2x} + e^{4x-4})$
$y' = \frac{1}{\ln(e^{2x} + e^{4x-4})} \cdot (e^{2x} \cdot 2 + e^{4x-4} \cdot 4)$
g) $y = \ln(\ln(2x))$
$y' = \frac{1}{\ln(2x)} \cdot \frac{1}{2x} \cdot 2$

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

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

(i) $y = \frac{3}{4} e^{x \sin x}$

$y' = \frac{3}{4} e^{x \sin x} (x \cos x + \sin x)$

(j) $y = \frac{e^{\sin x} + e^x}{(\ln x - \sec(\ln x))^3}$

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

2. (a) $y = e^{5x^2}$

$y' = e^{5x^2} \cdot 10x$

$y' = 10x e^{5x^2}$

$y'' = 10x \cdot e^{5x^2} \cdot 10x + e^{5x^2} \cdot 10$

$y'' = 100x e^{5x^2} + 10 e^{5x^2}$

(b) $y = 2\ln x^4 - (\ln x)^2$

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

$y' = \frac{8}{x} - \frac{2\ln x}{x}$

$y' = 8x^{-1} - \frac{2\ln x}{x}$

$y'' = -8x^{-2} - \left[\frac{x \cdot 2 \cdot \frac{1}{x} - 2\ln x}{x^2}\right]$

3. (a) $y = x^2 - \ln(x^2+4x)$ at $x = 2$

$y = 4 - \ln(-4)$

no sol'n $x = -2$ is undefined

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

$m = 2(-2) - \frac{1}{4-8}(0)$

$m = -4$

(b) $y = x^2 e^{2x-5}$ at $(3, 9e)$

$y' = x^2 e^{2x-5}(2) + e^{2x-5} \cdot 2x$

$y' = 2x^2 e^{2x-5} + 2x e^{2x-5}$

$m = 18e + 6e$

$24e$

$y - 9e = 24e(x-3)$

$y - 9e = 24ex - 72e$

$y = 24ex - 63e$

4. $\ln x - 3y^3 + e^y = x^2 \ln y$

$\frac{1}{x} - 9y^2 \frac{dy}{dx} + e^y \frac{dy}{dx} = x^2 \cdot \frac{1}{y} \frac{dy}{dx} + \ln y \cdot 2x$

$\frac{1}{x} - 9y^2 \frac{dy}{dx} + e^y \frac{dy}{dx} = \frac{x^2}{y} \frac{dy}{dx} + 2x \ln y$

$-9y^2 \frac{dy}{dx} + e^y \frac{dy}{dx} - \frac{x^2}{y} \frac{dy}{dx} = 2x \ln y - \frac{1}{x}$

$\frac{dy}{dx}(-9y^2 + e^y - x^2/y) = 2x \ln y - \frac{1}{x}$

$\frac{dy}{dx} = \frac{2x \ln y - \frac{1}{x}}{-9y^2 + e^y - x^2/y}$

5. $y = \dfrac{(6x^2-8x)^7 e^{1-x^3}}{x^3(2-7x)^2}$

$\ln y = 7\ln(6x^2-8x) + (1-x^3)\ln e - 3\ln x - 2\ln(2-7x)$

$\frac{1}{y}\frac{dy}{dx} = 7\cdot\frac{1}{6x^2-8x}(12x-8) + (-3x^2) - 3\cdot\frac{1}{x} - 2\cdot\frac{1}{2-7x}(-7)$

$\frac{dy}{dx} = y\left[\frac{7(12x-8)}{6x^2-8x} - 3x^2 - \frac{3}{x} + \frac{14}{2-7x}\right]$

5. (b) $y = \sin x^{\tan x^2}$

$\ln y = \tan x^2 \ln(\sin x)$

$\frac{1}{y}\frac{dy}{dx} = \tan x^2 \cdot \frac{1}{\sin x}\cdot\cos x + \ln(\sin x)\cdot\sec^2 x^2\cdot 2x$

$\frac{dy}{dx} = y\left[\frac{\tan x^2\cos x}{\sin x} + 2x\ln(\sin x)\cdot\sec^2 x^2\right]$

6. $y = x^2 - 32\ln x$

$y' = 2x - 32 \cdot \frac{1}{x}$

$2x - 32x^{-1} = 0$

$2x^{-1}(x^2 - 16) = 0$

$2x^{-1}(x-4)(x+4) = 0$

$x = 0, 4, -4$

$y = x^2 - 32\ln x$

$x = 0 \quad y = 0 - 32\ln(0)$ undef

$x = -4 \quad y = (16) - 32\ln(-4)$ undef

$x = 4 \quad y = 16 - 32\ln 4$

∴ minimum

7. $4e^{2x}\ln y - y^3 + e^{\sin x} = \sec y + 3x$

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

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

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

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

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

8. $y = 4x^2 e^{-x^2}$

$y' = 4x^2 e^{-x^2}(-2x) + e^{-x^2} 8x$

$-8x^3 e^{-x^2} + 8x e^{-x^2}$

$-8x e^{-x^2}(x^2 - 1) = 0$

$-8x e^{-x^2}(x-1)(x+1) = 0$

$0, 1, -1$

	$-8x e^{-x^2}$	$(x-1)$	$(x+1)$	y'
$(-\infty, -1)$	+	−	−	+ inc
$(-1, 0)$	+	−	+	− dec
$(0, 1)$	−	−	+	+ inc
$(1, \infty)$	−	+	+	− dec

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

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

$3x^2 - 375x^{-1} = 0$

$3x^{-1}(x^3 - 125) = 0$

$x = 0, \; x = 5$