Combining Rules

1.Find the derivative function for each of the following:

a) $f(x) = \left(\dfrac{1-4x^2}{1+3x}\right)^7$

b) $y = 3(1+3x)^2(2-x)^3$

c) $f(x) = x^{\frac{2}{3}}\sqrt{2x+3x^2}$

d) $g(x) = (3x-5)^5(3x^2-2x+1)^4$

e) $k(x) = \dfrac{(7x^2-5x+3)^2}{(1-5x)^3}$

f) $f(x) = e^{-x}\ln x$

g) $h(x) = e^{-2x}\sin(3x)$

h) $y = \sqrt{1+x}\cdot\ln(x+2)$

i) $f(x) = \sin(x^3)\cdot\cos(1-x)$

j) $g(x) = e^{5x^2-2}\cdot\sin(2x-1)$

k) $y = \dfrac{\sin^4(3x^2)}{e^{2x^2-x+6}}$

l) $y = \dfrac{\ln(x^3-2x)^4}{\sin\sqrt{x^2-1}}$

2. Find the equation of the tangent line to $f(x) = \sqrt{2x+1}(3-x)^2$ at the point where $x = 4$.

3. Find the equation of the tangent line to $f(x) = \dfrac{2x}{\sqrt{5x+1}}$ at the point where $x = 3$.

4. Find the point of contact to $f(x) = \dfrac{x-4}{x-1}$ of all tangents which pass through the external point $K(0, -8)$ which is not on $f(x)$.

5. Find the equation of the tangent line to $f(x) = \sqrt{3-x}(3x+1)^2$ at the point where $x = -1$.
{ $25x + y + 17 = 0$ }

6. Find the equation of the tangent line and the normal line to $f(x) = \sqrt{6-x}(5-x^2)^2$ at the point where $x = 2$.
{tangent $65x = 4y - 138 = 0$, normal $4x - 65y + 122 = 0$ }

7. Find the equation of the tangent line to $f(x) = 4x^2 - 5x + 5\ln(3x-8)$ at the point where $x = 3$.
{ $34x - y - 81 = 0$}

8. Find the equation of the tangent line to $f(x) = e^{x-3}\cdot\ln(e^{x^2})$ at the point where $x = 3$. { $15x - y - 36 = 0$ }

9. Find the equation of the tangent line to $f(x) = 3\cos^2 x + 4\sin x + 5$ at the point where $x = 0$.
{ $4x - y + 8 = 0$ }

1. a) $7\left(\dfrac{1-4x^2}{1+3x}\right)^6\left(\dfrac{(-8x)(1+3x)-(3)(1-4x^2)}{(1+3x^2)^2}\right)$

b) $6(1+3x)(3)(2-x)^3 + 3(1+3x)^2\,3(2-x)^2(-1)$

c) $\dfrac{2}{3}x^{-\frac{1}{3}}\sqrt{2x+3x^2}^{\,-1} + \dfrac{1}{2}(2x+3x^2)^{\frac{1}{2}}(2+6x)(x^{\frac{2}{3}})$

d) $15(3x-5)^4(3x^2-2x+1)^4 + 4(3x^2-2x+1)^3(6x-2)(3x-5)^5$

e) $\dfrac{\left[2(7x^2-5x+3)(14x-5)\right]\left[(1-5x)^3\right] - \left[3(1-5x)^2(-5)\right]\left[(7x^2-5x+3)^2\right]}{\left[((1-5x)^3)^2\right]}$

f) $-(e^{-x})(\ln x) + \left(\dfrac{1}{x}\right)(e^{-x})$

g) $-2(e^{-2x})(\sin(3x)) + 3(e^{-2x})(\cos(3x))$

h) $\frac{1}{2}(1+x)^{-\frac{1}{2}}(\ln(x+2)) + (1+x)^{\frac{1}{2}}\left/\dfrac{1}{x+2}\right.$

i) $(\sin(x^3))(-\sin(1-x)(-1)) + ((\cos(x^3))(3x^2))(\cos(1-x))$

j) $(e^{5x^2-x})((\cos(2x-1))(2)) + (e^{5x^2-x})(10x)(\sin(2x-1))$

k) $\dfrac{\left[(4\sin^3(3x^2))(\cos(3x^2))(6x)\right]\left[e^{2x^2-x+6}\right] - \left[(e^{2x^2-x+6})(4x-1)\right]\left[\sin^4(3x^2)\right]}{\left(e^{2x^2-x+6}\right)^2}$