Review Problems for Midterm II

Midterm II: Monday, October 18 in class
Topics: 3.1-3.7 (except 3.4)

1. Use the definition of derivative $f'(x) = \lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$ to find the derivative of the functions.
(a) $f(x) = \sqrt{2x+3}$ (b) $f(x) = \frac{1}{2x+3}$.

2. Find the derivative of the following functions and simplify your answers.
(a) $12x^5 - \frac{3}{7x^2} + 4x^{\frac{-2}{5}}$ (b) $(1+4x)e^{-4x}$ (c) $(\sec(x) + \tan(x))^3$

(d) $x^5 \cos(x) - 6x \sin(x) - 6\cos(x)$ (e) $\left(\frac{\cos(x)}{1+\sin(x)}\right)^5$

3. Find the derivative of the following functions. You don't have to simplify your answer.

(a) $(2x+1)^3(1+e^{2x})^5$ (b) $\frac{(2x+1)^3}{(1+e^{2x})^5}$ (c) $\tan(\sin(xe^x))$ (d) $\cot^6\left(\frac{2}{t}\right)$
(e) $\frac{7}{\sqrt[4]{x^2+e^{x^2}}}$ (f) $e^{\sec(x^2)}$ (g) $\sin^3(2t)\cos^3(2t)$ (h) $x^3 \tan^3((1+x^2)^2)$
(i) $\frac{e^{x^2}\csc(3x)-x^2}{(1+x^2)^2}$ (j) $x^4 e^{-3x}\cos(5x)$ (k) $\frac{\sin^{-5}(2x)}{x} - \frac{x\cos^3(2x)}{3}$ (l) $\sqrt{1+t\cos(t^2) - \frac{2t^3}{3}\sin(t^2)}$

4. Find the first derivative (y') and second derivative (y'') of the following functions.
(a) $y = (6+\frac{4}{x})^5$ (b) $y = x^3 e^{3x}$

5. Use implicit differentiation to find $\frac{dy}{dx}$.

(a) $2xy - y^2 = x$ (b) $x^3 + 3x^2y + y^3 = 8$ (c) $\frac{x+y}{x-y} = x^2 + y^2$
(d) $\cos(xy) + x^5 = y^5$ (e) $e^{xy} = \sin(x+5y)$

6. Show that $(1,2)$ lie on the curve $2x^3 + 2y^3 - 9xy = 0$. Then find the the tangent and normal to the curve at $(1,2)$.

7. Find the normal to the curve $xy + 2x - y = 0$ that are parallel to the line $x + 2y = 0$.