Problem 1. Find the derivative of the following functions .

a. $f(x) = \frac{\tan(x)-5}{\sec(x)}$ *b.* $f(x) = 3\sec(x)$ *c.* $f(x) = \frac{3x^2\tan(x)}{\sec(x)}$

d. $f(x) = -11x\sin(x)\cos(x)$ *e.* $f(x) = 4e^x\sin(x)$ *f.* $f(x) = x^2\ln(x)$

Problem 2. Find the derivative of the following functions by the chain rule.

a. $f(x) = \cos(5x^4 + 4x^2 + 3)$ *b.* $f(x) = \sin(\cos(x^3))$

c. $f(x) = x^4 tan^{-1}(3x)$ *d.* $f(x) = \sin^{-1}(\cos(x))$

e. $f(x) = 7\ln(\sec(x) + \tan(x))$ *f.* $f(x) = e^{x\sin(x)}$

g. $f(x) = \log_{10}^{(xe^x)}$ *h.* $f(x) = \ln\ln\ln x$

i. $f(x) = \ln|\cos(\ln x)|$ *j.* $f(x) = 3^{x^3\cos(x)}$

Problem 3. Find $\frac{dy}{dx}$ in each equation by using implicit differentiation. Find the equation of the tangent line at $x = 2$ in part (a).

a. $x^2 + y^2 = 4$ *b.* $2y = x^2 + \sin(y)$ *c.* $x^2y + 3xy^3 = x + 3$

d. $\sin(xy) = y$ *e.* $x^y = y^x$ *f.* $y = \ln(x^2 + y^2)$

Problem 4. Find the derivative of the following functions through logarithmic differentiation.

a. $f(x) = \frac{x^3(x-4)^4}{(x^2+5)^9}$ *b.* $f(x) = 4x^{\ln(x)}$ *c.* $f(x) = (\tan x)^x$

Problem 5. A rock is thrown into a still pond and causes a circular ripple. If the radius of the ripple is increasing at a rate of 2 feet/second, how fast is the circumference changing when the radius is 17 feet?

Problem 6. Helium is pumped into a spherical balloon at a rate of 4 ft^3/sec. How fast is the radius increasing after 3 minutes?

Problem 7. Use linear approximation to approximate $\sqrt[3]{1.1}$.