Find the derivative of $(3x+4)^{2x}$

Method 1: use implicit differentation and logarithmic differentiation:

Write as an equation and "simplify" until the equation is in a format in which you know how to take the derivative:

$y = (3x+4)^{2x}$

$ln(y) = ln(3x+4)^{2x}$

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

Now that we have an equation where we know how to take the derivative of both sides, we can take the derivative using implicit differentiation:

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

$y' = y[2ln(3x+4) + \frac{6x}{3x+4}] = (3x+4)^{2x}[2ln(3x+4) + \frac{6x}{3x+4}]$

Method 2: Use logarithmic differentiation directly:

$(3x+4)^{2x} = e^{ln(3x+4)^{2x}}$

Thus $[(3x+4)^{2x}]' = [e^{ln(3x+4)^{2x}}]' = [e^{2x \cdot ln(3x+4)}]'$

1.) Suppose car A is 110 miles north of an intersection and traveling south at 50 mph. Suppose car B is 100 miles east of the same intersection and traveling west at 20 mph. 1a.) At what rate are the cars approaching each other after 1 hour? 1b.) After 3 hours?

2.) Suppose the distance between two planes must be maintained at 10 miles. Suppose plane W is north of a radio tower and moving south while plane G is east of the same radio tower. If plane G is moving east at 1 mile/second, how fast should plane W be moving when plane G is 6 miles from the radio tower?

3.) A water tank has the shape of an inverted circular cone with base radius 12 m and height 4 m. Suppose water is leaking out of the cone at a rate of 5 m^3/min. while water is being pumped into the cone at a rate of 9 m^3/min. Find the rate at which the water level is rising when the water is 1.5 m deep.

HW7
3.7) 31, 39
3.8) 11, 15, 17, 19, 21, 25, 29, 31, 41, 43, 47, 49
3.10) 2-38 even (ie, all even problems)

3/8: Quiz 5: 3.6, 3.7, 3.8