The Composition of Functions   NAME:

1. Let $f(x) = \dfrac{4x^2 + 5}{3}$ and $g(x) = -3x + 7$. Find the following and simplify.

a.) $f(g(-3))$

b.) $f(g(x))$

c.) $f(g(5))$ [Hint: You can do this problem how you likely did part a or you can use the formula you found in part b.]

d.) Use words to explain the difference between $f(g(5))$ and $f(5) \cdot g(5)$.

2. The number of cars N (per day) produced at a factory after t hours of operation is given by $N(t) = 100t - 5t^2$ where t varies from 0 to 10. If the cost C (in dollars) of producing N cars is $C(N) = 15000 + 8000N$, use composition to find the cost as a function of time. Simplify your answer.

3. Let's check the answer from above. We'll find the cost of running the factory 9 hours per day using two different methods. **You must show work for full credit.**
a.) Use the given $N(t)$ formula to find the number of cars they would produce in 9 hours. Include units.

b.) Put your answer to part a into the given $C(N)$ formula to find the cost of producing that many cars. Include units.

c.) Now, use the formula you made in question 2 to find the cost of running the factory 9 hours per day. *Show your work!* Include units. Does this match your answer to question 3b?

One cool thing about composition is that it eliminates the middle step. You go straight from hours of operation to cost, without figuring the number of cars in the middle. Our formula from question 2 combines parts a and b from question 3 into one step (#3c).