2. [14 points] Psychiatrists and food scientists teamed up to measure how the concentration of different sweeteners affect the perception of sweetness. "Sweetness units" (SU) in this trial ranged from 1 to 15.

- The function $F(C)$ gives the sweetness units (SU) of a $C\%$ fructose solution. (A concentration of $C\%$ means that, by mass, the fructose was $C\%$ of the total solution and the rest was water.)
- The function $A(C)$ gives the sweetness units (SU) of a $C\%$ Alitame solution. (A concentration of $C\%$ means that, by mass, the Alitame was $C\%$ of the total solution and the rest was water.)

a. [6 points] Write an expression or equation, using A, A^{-1}, F, F^{-1}, or their combinations or compositions, that represents each of the following sentences or phrases.

(i) The perceived sweetness of a 6% fructose solution is 9 SUs.

_____

(ii) The concentration of Alitame that gives a perceived sweetness of 8 SU

_____

(iii) A 0.01% solution of Alitame is 100 times sweeter than a 1% solution of fructose.

_____

b. [2 points] Which of the following compositions make sense in the context of the problem? *Bubble in all that apply.*

- ◯ $A(F(15))$
- ◯ $F(A(0.05))$
- ◯ $A^{-1}(F(11))$
- ◯ $A(F^{-1}(10))$
- ◯ $A^{-1}(F^{-1}(5))$
- ◯ NONE OF THE ABOVE

This information is repeated from the previous page for convenience.

- The function $F(C)$ gives the sweetness units (SU) of a $C\%$ fructose solution. (A concentration of $C\%$ means that, by mass, the Fructose was $C\%$ of the total solution and the rest was water.)
- The function $A(C)$ gives the sweetness units (SU) of a $C\%$ Alitame solution. (A concentration of $C\%$ means that, by mass, the Alitame was $C\%$ of the total solution and the rest was water.)

c. [3 points] The scientists found that $F(C)$ was linear, with a slope of 1.33. Given that, which of the following statements about $F(C)$ are TRUE? *Bubble in all that apply.*

◯ A 10% fructose solution will be 33% sweeter than a 9% fructose solution.

◯ An 8% fructose solution will be about 4 SUs sweeter than a 5% fructose solution.

◯ A 4% fructose solution will be 1.33 SUs *less sweet* than a 5% fructose solution.

◯ $F(C)$ is an increasing function.

◯ $F(C)$ has a constant average rate of change.

◯ NONE OF THE ABOVE

d. [3 points] The scientists published the following table of data for the function $A(C)$.

C	0.0025	0.005	0.01	0.02
$A(C)$	6.89	9.36	11.4	12.8

Which of the following statements about $A(C)$ may be TRUE, given data in the table provided. *Bubble in all that apply.*

◯ $A(C)$ is increasing.

◯ The average rates of change of $A(C)$ are decreasing.

◯ $A(C)$ is linear.

◯ $A(C)$ is concave up.

◯ $A(C)$ is concave down.

◯ NONE OF THE ABOVE