1. [5 points] You have **two hours** to complete this exam, which is 5 pages and has 9 problems (including this one) totaling 100 points. You may use a graphing calculator (according to the requirements on the course website), as well as your textbook or ebook and any notes. Electronic notes such as pdf files are allowed if they were downloaded in advance.

This final exam is to be completed **without** use of the internet (except to access this exam and submit work). You may **not** use help from other individuals (other students, tutors, online help forums, etc.), and will **not** communicate with any other person about the exam until 9pm today (i.e., 9pm EDT on Monday, April 27).

As your submission for this problem, you must write "I agree", sign your name, and write your UMID number to signify that you understand and agree to this policy. By doing this you are attesting that you have not violated this policy.

2. [13 points] Suppose that $h(x)$ is invertible and twice differentiable. Some values of $h(x)$ and its derivatives are listed in the table below. Missing values are denoted by a "?".

x	0	2	4	6	8	10
$h(x)$	-1	0.4	?	2	3.4	?
$h'(x)$	1.2	0	0.8	1.2	0.6	?
$h''(x)$	-0.8	0	0	?	-0.2	-1

You do not need to show work for this problem, but limited partial credit may be awarded for work shown. Answer each of the following, or if there is not enough information, write NEI.

a. [2 points] Let $a(x) = h(8e^{3-x})$. Find $a'(3)$.

b. [2 points] Let $b(x) = h(x)h'(x)$. Find $b'(0)$.

c. [2 points] Let $c(x) = h^{-1}(x)$. Find $c'(2)$.

d. [2 points] The tangent line to $h(x)$ at $x = 10$ is given by $y = 0.4x + 8$. Find $h(10)$ and $h'(10)$.

e. [2 points] Find $\lim_{k\to 0} \dfrac{h(4+k) - h(4)}{k}$.

f. [3 points] Assume that between each consecutive pair of columns in the table, the values of $h''(x)$ are either always positive or always negative. Which of the values $x = 0, 2, 4, 6, 8, 10$ must be inflection points of $h(x)$?

3. [12 points] In parts of Antarctica, snowfall accumulates each year and is eventually compacted into ice. A research team is drilling down into this ice to collect a sample, called an ice core, of snowfall from past years.

- Let $D(t)$ be the depth below the surface, in feet, that the drill has reached t minutes after it begins drilling the ice core.
- Let $A(p)$ be the age, in years, of the ice at a depth of p feet below the surface.

The functions $D(t)$ and $A(p)$ are invertible and differentiable. Use a complete sentence to write a practical interpretation for the equations in **a.**–**c.**

a. [3 points] $D^{-1}(A^{-1}(110)) = 35$

b. [3 points] $A'(185) = 12$

c. [3 points] $\displaystyle\int_{60}^{120} D'(t)dt = 172$

d. [3 points] Write an expression involving an integral that represents the average age of the ice in the first 300 feet below the surface.