1. [9 points] The function f(x) is invertible and twice differentiable for all real numbers. The table to the right gives several values of f'(x), the derivative of f(x). You do not need to show work in this problem, but limited partial credit may be awarded for work shown.

x	-2	0	2	3	6
f'(x)	6	4	3	0	2

a. Compute each of the following values <u>exactly</u>. If there is not enough information, write NEI. If the value does not exist, write DNE.

i. [2 points]
$$\lim_{k\to 0} \frac{f(-2+k) - f(-2)}{k}$$

Answer: 6

ii. [2 points] Let $h(x) = 3\cos(x)f(x)$. Find h'(0).

Solution: $h'(x) = 3\cos(x)f'(x) - 3\sin(x)f(x)$

Answer: ______12

iii. [2 points] Let $g(x) = f\left(\frac{6}{x}\right)$. Find g'(3).

Solution: $g'(x) = f'\left(\frac{6}{x}\right)\left(\frac{-6}{x^2}\right)$

b. [1 point] Use the table to give the best possible estimate of f''(1).

Answer: $f''(1) \approx \frac{\frac{3-4}{2-0} = \frac{-1}{2}}{}$

c. [2 points] Suppose that f(6) = 0. Write a formula for the linear approximation L(x) of $f^{-1}(x)$, the inverse of f(x), at x = 0.

Solution: The slope of L(x) is $(f^{-1})'(0) = \frac{1}{f'(6)} = \frac{1}{2}$.

2. [6 points] Let P(h) be the current pressure, in millibars (mb), of the air above Ann Arbor at a height of h meters (m) above the ground.

Use a complete sentence to write a practical interpretation of each of the following equations.

a. [3 points] P'(6000) = -0.05

Solution: The pressure at a height of 6100 meters above the ground is about 5 millibars lower than the pressure at 6000 meters above the ground.

b. [3 points] $\int_0^{4000} P'(h) dh = -510$

Solution: The pressure at a height of 4000 meters above the ground is 510 millibars lower than the pressure at ground level.