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 **exactly**. If there is not enough information, write NEI. If the value does not exist, write DNE.

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

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 $g(x) = f\left(\dfrac{6}{x}\right)$. Find $g'(3)$.

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

Answer: -2

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

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

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 $(f^{-1})'(0) = \dfrac{1}{f'(6)} = \dfrac{1}{2}$.

Answer: $L(x) = 6 + \dfrac{1}{2}\,x$

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] $\displaystyle\int_0^{4000} P'(h)\,dh = -510$

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