2. [14 points] The following table gives values of three functions at three different x values.

x	1	4	9
$f(x)$	5	-4	-13
$g(x)$	48	6	3/16
$h(x)$	2	4	6

a. [4 points] Peter thinks $f(x)$ is **linear**. Find Peter's formula for $f(x)$ in exact form, if possible. If $f(x)$ can't be linear based on the information given, write "not possible" in the blank and explain why it can't be linear.

$f(x) =$ not possible .

Solution: This function can't be linear. The average rate of change on $[1, 4]$ is -3, but on $[4, 9]$ it's -9/5. Linear functions must have constant average rates of change, so this function is disqualified.

b. [5 points] Sarah thinks $g(x)$ is **exponential**. Find Sarah's formula for $g(x)$ in exact form, if possible. If $g(x)$ can't be exponential based on the information given, write "not possible" in the blank and explain why it can't be exponential.

$g(x) =$ $96(0.5)^x$.

Solution: If we try to write an exponential function, we can use the points $(1, 48)$ and $(4, 6)$ and the equation $g(x) = ab^x$. This gives us the system of equations $48 = ab$ and $6 = ab^4$. Eliminating a, we get $\frac{1}{8} = b^3$, so $b = 0.5$. This means $a = 96$. The function we found also passes through the third point $(9, \frac{3}{16})$.

c. [5 points] Sally thinks $h(x)$ is a **power function**. Find Sally's formula for $h(x)$ in exact form, if possible. If $h(x)$ can't be a power function based on the information given, write "not possible" in the blank and explain why it can't be a power function.

$h(x) =$ $h(x) = 2x^{1/2}$.

Solution: If we try to write a power function, we can use the points $(1, 2)$ and $(4, 4)$ and the equation $h(x) = kx^p$. The first point immediately gives us $2 = k$, and so $4 = 2(4)^p$ (using the second point). We can solve for p using logs or common sense, but either way, $p = 1/2$. The function we found also passes through the point $(9, 6)$, so we have our answer.