Show all work. Answers given with incomplete reasoning will not receive full credit.

Question 1 (3 points) Find the equation of the line that passes through the point (1, 2) and is perpendicular to the line $x - 2y = 1$.

Since $x - 2y = 1$, we have $2y = x - 1$ \[\Rightarrow y = \frac{1}{2}x - \frac{1}{2}\] The slope of this line is $\frac{1}{2}$, so our line has slope $-\left(\frac{1}{2}\right) = -2$ \[\text{Now, use point-slope form with } m = -2, P = (1, 2) \text{ to get } y - 2 = -2(x - 1) \]
\[\Rightarrow y - 2 = -2x + 2 \Rightarrow y = -2x + 4\]

Question 2 (2 points) Find the domain of the function $f(x) = \frac{x - 100}{x\sqrt{x + 1}}$.

First, we need $x + 1 \geq 0 \Rightarrow x \geq -1$. \[\text{Second, we need } x\sqrt{x + 1} \neq 0 \Rightarrow x \neq 0, x \neq -1.
\]
So, the domain is $x \geq -1 \text{ with } x \neq 0, x \neq -1$ or $(-1, 0) \cup (0, \infty)$.
Question 3 (2 points) Find the average rate of change of the function

\[ f(x) = x^2 + 3x - 1 \]

on the interval [0, 2].

Note that

\[
\begin{align*}
    f(0) &= 0^2 + 3 \cdot 0 - 1 = -1 \\
    f(2) &= 2^2 + 3 \cdot 2 - 1 = 9
\end{align*}
\]

So, average rate of change = \( \frac{f(2) - f(0)}{2 - 0} \)

\[
= \frac{9 - (-1)}{2} = \frac{10}{2} = 5
\]