Directions: Please answer the following questions and make sure your answer are legible. You must show your work to receive credit for your answers. You may not use a calculator (or any other technology) on this quiz. Good Luck.

1. (4 points) Solve the equation $4 - |x| = 2x + 1$

$$\begin{align*}
|4 - 2x - 1| &= |x| \\
|\frac{1}{2} - 2x + 3| &= |x| \\
&= x \\
&= x = \begin{cases} 
3x - 3 \\
x = 1 
\end{cases}
$$

2. (10 points) Let $f(x) = \frac{1}{3}|2x - 1|

(a) Sketch the graph of $f(x)$

(b) Find the domain and range of $f(x)$

(c) Find the coordinates of the $x$- and $y$-intercepts (if any) of the graph of $f(x)$.

(d) Find the local maxima and minima of $f(x)$, if none, say ‘none.’

$$\begin{align*}
|2x - 1| &= \begin{cases} 
2x - 1 & \text{if } x \geq \frac{1}{2} \\
-2x + 1 & \text{if } x < \frac{1}{2} 
\end{cases} \\
\frac{1}{3} |2x - 1| &= \begin{cases} 
-\frac{1}{3} (2x - 1) & \text{if } x < \frac{1}{3} \\
\frac{1}{3} (2x - 1) & \text{if } x \geq \frac{1}{3} 
\end{cases}
$$
3. (3 points) Use completion of squares to write the polynomial $x^2 + 5x - 1$ in the form $a(x+b)^2 + c$.

\[
\left(x + \frac{5}{2}\right)^2 - \frac{29}{4}
\]

4. (5 points) Let \( f(x) = 2x^2 - 4x - 1 \)

(a) Find the vertex of the parabola

(b) Sketch the parabola

(c) Does the vertex yield and absolute maximum or absolute minimum?

5. (3 points) Solve \( y^2 - 3y = 4x \) for \( y \)

\[
(y - \frac{3}{2}) = \pm \sqrt{\frac{9 + 16x}{4}}
\]