Name $\qquad$

- You have 20 minutes

1. (a) (3 points) Let $f(x)=x^{3}+x+3$. Use Newton's method with initial approximation $x_{0}=-1$ to find $x_{1}$, the next approximation to the root of the equation $f(x)=0$. Please write your answer as a fraction and put a box around it.
(b) (2 points) The graph of a function $h(x)$ is shown below, along with its tangent line at the point $x=7 / 4$. The roots of $h(x)$ are $x \approx-0.4142, x=1$, and $x \approx 2.4142$. If I use Newton's method with initial guess $x_{0}=7 / 4$ to approximate a root of $h(x)$, which root will I find? (Circle the correct answer)

$$
x \approx-0.4142 \quad x=1 \quad x \approx 2.4142
$$


2. (a) (2 points) State the Mean Value Theorem
(b) (3 points) Let $f(x)=x^{3}-3 x+2$. Verify that $f(x)$ satisfies the hypotheses of the Mean Value Theorem on the interval $[-3,3]$. Then find all numbers $c$ that satisfy the conclusion of the Mean Value Theorem. Please put a box around your answer.

