First Exam, Math 110

1. Solve
\[
\frac{2x - 1}{x} + \frac{3}{x - 2} = 0.
\] (2 points)

2. Find the function \( f \) whose graph is a line with slope 3 that goes through the point \((1, 2)\). (2 points)

3. You have just opened a new nightclub, and you are unsure of how high to set the entrance fee. One week you charged $10 per guest and averaged 300 guests per night. The next week you charged $15 per night and averaged 250 guests. Find a linear demand function showing the number of guests \( q \) per night as a function of the entrance fee \( p \). (2 points)

4. You operate a gaming website where users have to pay a small fee to log on. Market research has shown that when you charge a log-on fee of $p, the demand is \( q = -100p + 1000 \) log-ons per month. Your internet provider charges you $50 per month plus $0.50 per log-on.
   a) Find the monthly cost \( C \) (as a function of the log-on fee \( p \)). (2 points)
   
   b) Find the monthly revenue \( R \) (as a function of the log-on fee \( p \)). (2 points)
   
   c) Find the log-on fee that maximizes your monthly profit. (2 points)
   
   d) Find the maximum monthly profit. (1 point)

5. Find the exponential function \( f \) whose graph passes through the points \((0, 3)\) and \((2, 1)\). (2 points)