1. (12 pts.) \( f'(x) = \lim_{h \to 0} \frac{2(x+h)^2 - 2x^2}{h} = \lim_{h \to 0} \frac{2x^2 + 4xh + 2h^2 - 2x^2}{h} = \lim_{h \to 0} (2x + h) = 4x \)
   \( f'(1) = 4(1) = 4 \)

2. (12 pts.) \( \lim_{x \to 4} \frac{x^2 - x - 12}{x - 4} = \lim_{x \to 4} \frac{(x-4)(x+3)}{x-4} = \lim_{x \to 4} (x + 3) = 7 \)

3. (12 pts.)
   (a) \( \lim_{x \to -2^+} f(x) = 3 \)
   (b) \( \lim_{x \to 0^-} f(x) \) does not exist
   (c) No
   (d) Yes

4. (12 pts.)
   (a) On \(-2 < x < -1\) and \(-1 < x < 0\) and \(0 < x < 2\) and \(2 < x \leq 3\) because the graph appears to be smooth on these intervals.
   (b) At \(x = -1\) because the left-hand derivative at \(-1\) is different from the right-hand derivative at \(-1\).
   (c) At \(x = 0\) and \(x = 2\) because the left-hand limit and the right-hand limit at \(0\) do not agree and the limit at \(2\) and \(f(2)\) do not agree.

5. (12 pts.)
   (a) \( N'(a) = -2a + 300 \)
   (b) \( N(10) = -100 + 3000 + 6 = 2906 \)
   (c) \( N'(10) = -20 + 300 = 280 \)

6. (12 pts.) Since \( y = x^2 + 7x - 1 \), \( \frac{dy}{dx} = 2x - 7x^2 = 2x - \frac{7}{2x} \) and \( \frac{d^2y}{dx^2} = 2 + 14x^{-3} = 2 + \frac{14}{x^3} \)

7. (15 pts.)
   (a) \( \frac{dy}{dx} = 12x - 10 + \frac{10}{x^2} \)
   (b) Since \( v = \frac{1-t^2}{2+t} \), \( \frac{dv}{dt} = \frac{(1+t^2)(-1)-(1-t)(2t)}{(1+t^2)^2} = \frac{-1-t^2-2t+2t^2}{(1+t^2)^2} = \frac{t^2-2t-1}{(1+t^2)^2} \)
   (c) \( \frac{dy}{dx} = (x-1)(2x+1) + (x^2 + x + 1) = 2x^2 - x - 1 + x^2 + x + 1 = 3x^2 \)

8. (13 pts.)
   (a) \( f'(x) = 10x = 0 \Rightarrow x = 0 \). Therefore the graph has horizontal tangent at \(x = 0\).
   (b) \( f'(x) = 5 \Rightarrow 10x = 5 \Rightarrow x = \frac{1}{2} \). Therefore at \(x = \frac{1}{2}\), the slope of the tangent is 5. Since \( f\left(\frac{1}{2}\right) = \frac{9}{4} + 1 = \frac{9}{4} \), the equation for the tangent is \( y - \frac{9}{4} = 5\left(x - \frac{1}{2}\right) \Rightarrow y = 5x - \frac{5}{2} + \frac{9}{4} \Rightarrow y = 5x - \frac{1}{4} \).

9. (Bonus: 10 pts.)
   \[ \left| \sqrt{x + 1} - 2 \right| < 0.01 \iff -0.01 < \sqrt{x + 1} - 2 < 0.01 \]
   \[ \iff 1.99 < \sqrt{x + 1} < 2.01 \]
   \[ \iff 3.9601 < x + 1 < 4.0401 \]
   \[ \iff 2.9601 < x < 3.0401 \]

Therefore the inequality \( \left| \sqrt{x + 1} - 2 \right| < 0.01 \) holds on the open interval \((2.9601, 3.0401)\) about 3. Since \(3 - 2.9601 = 0.0399\) and \(3.0401 - 3 = 0.0401\), we choose the smaller value as \(\delta\), i.e. \(\delta = 0.0399\).