Answer all questions to the best of your ability. Full credit will only be given if all work is shown and organized and it is clear what your answer is. The quiz is out of 10 points.

1. (3 points) Use the technique of completing the square to find the vertex of \( f(x) = \frac{2}{3}x^2 + \frac{4}{3}x - 1 \).
   Does the graph open up or down, why? Is the vertex a maximum or minimum?
   
   \[ f(x) = \frac{2}{3} \left( x^2 + \frac{3}{2}x \right) - 1 = \frac{2}{3} \left( x^2 + \frac{3}{2}x + \frac{3}{4} \right) - 1 \]
   
   \[ = \frac{2}{3} \left( x + \frac{3}{4} \right)^2 - \frac{3}{4} \]
   
   \[ \text{Vertex: } (-1, -\frac{5}{3}) \]

   The graph opens up since \( \frac{3}{2} > 0 \).

   The vertex is a minimum.

2. (3 points) We know a function has the form \( f(x) = ax^2 + bx + c \) has vertex at (3, 4) and goes through the point (5, 20). Tell me what the variables \( a, b \) and \( c \) are.

   \[ f(x) = a(x-h)^2 + k = 0 \quad f(h) = a(3-3)^2 + 4 \]

   \[ f(5) = 20 = 0 \quad a(5-3)^2 + 4 = 20 = 0 \quad 4a + 4 = 20 = 4a = 4 \quad a = 4 \]

   \[ f(x) = 4(x-3)^2 + 4 = 4(x^2 - 6x + 9) + 4 = 4x^2 - 24x + 36 + 4 \]

   \[ = 4x^2 - 24x + 40 \]

   Thus \( a = 4 \), \( b = -24 \), \( c = 40 \).