• This exam is closed book. You may use one $8\frac{1}{2} \times 11$ sheet of notes.

• Do not share notes.

• In order to receive credit, you must show your work. Do not do computations in your head or only on your calculator. Instead, write them out on the exam paper.

• **Place a box around **YOUR FINAL ANSWER** to each question.**

• If you use a trial and error (or guess and check) method when an algebraic method is available, you will not receive full credit.

• If you need more room, use the backs of the pages and indicate to the reader that you have done so.

• Raise your hand if you have a question.

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(a) (4 points) Let \( f(x) = 3x^2 - x \). Compute and simplify \( \frac{f(2 + h) - f(2)}{h} \).

(b) (4 points) Find the vertex of the parabola \( y = \frac{1}{2} x^2 + 2x - 3 \). Then sketch the graph.

(c) (4 points) Solve for \( x \) in \( \frac{x}{x - 1} - \frac{3}{x + 1} = 2 \).
Tafu is an Econ professor. In 1996 he earned $43,000 and in 2000 he earned $48,000. Nell fries chicken at Ezell’s. In 1998 she earned $17,000 and in 2001 she earned $21,000.

(a) (3 points) Give a linear function relating Tafu’s salary \( T \) to the year \( t \).

(b) (3 points) Give a linear function relating Nell’s salary \( N \) to the year \( t \).

(c) (3 points) In what year will Tafu earn $28,000 more than Nell?

(d) (4 points) In what year will Tafu earn twice as much as Nell?
3 (12 points) Suppose you have a function \( y = f(x) \) such that the domain of \( f(x) \) is \( 1 \leq x \leq 6 \) and the range of \( f(x) \) is \( -2 \leq y \leq 10 \). Let \( g(x) = \frac{4}{3}x^2 - \frac{8}{3}x + 2 \).

- What is the domain of \( f(g(x)) \)?
- What is the range of \( f(g(x)) \)?
(13 points) Tafu is standing at the bottom of a hill with a soccer ball. Impose a coordinate system as shown in the picture. The hill slopes up at a constant rate of 2 vertical feet for each 3 horizontal feet. Tafu kicks the ball and it follows the path given by \( y = -\frac{1}{6}x^2 + \frac{17}{3}x \).

(a) (6 points) What is the maximum height of the ball above the hillside?

(b) (7 points) How far is the ball from Tafu when it hits the hillside?