

Present your work neatly. Show work to receive credit.

1. (15 points) Let  $f(x) = 3x^2 - x$ . Evaluate the difference quotient

$$\frac{f(x+h) - f(x)}{h}, \quad h \neq 0$$

2. (20 points) Solve the inequality, and express the solution using interval notation.

$$\frac{3x - 5}{x + 2} \leq 2$$

3. (10 points) Find the function that is finally graphed after each of the following transformations is applied to the graph of  $f(x) = \sqrt{x}$ .

- (a) Reflect about the y-axis
- (b) Shift left 2 units
- (c) Shift down 3 units

4. (15 points) Find the vertical asymptote(s), horizontal/oblique asymptote(s), if any, of the given function

$$G(x) = \frac{6x^2 + 7x - 5}{3x + 5}$$

5. (20 points) Use the given zero  $1 + 3i$  to find the remaining zeros of the function  $f(x) = x^4 - 7x^3 + 14x^2 - 38x - 60$ .

6. (20 points) Given

$$f(x) = \frac{x^2 + 3x - 10}{x^2 + 8x + 15}$$

- (a) Find the domain of  $f(x)$  and the y-intercept.

- (b) Find the x-intercept(s), and determine the behavior of the graph of  $f(x)$  near each x-intercept.

→ turn over

- (c) Locate the vertical asymptote(s) and any horizontal/oblique asymptote(s) of the graph. Check whether the graph of  $f(x)$  intersects the horizontal/oblique asymptote(s).
- (d) Using the real zeros of the numerator and denominator of  $f(x)$ , divide the x-axis into intervals and determine where the graph is above the x-axis and where it is below the x-axis by choosing a number in each interval and evaluating  $f(x)$ .
- (e) Put all the information together to obtain the graph of  $f(x)$ .