

**Question 1:**

(a)[5 points] Neatly sketch the graph of

$$f(x) = \begin{cases} 1 + x & \text{if } x < -1 \\ 1 + x^2 & \text{if } x \geq -1 \end{cases}$$

(b)[2 points] Determine both the domain and the range of the function in (a).

(c)[3 points] Use limits to show that  $g(x)$  is not continuous at  $x = -1$ .

**Question 2:**

(a)[7 points] Let  $g(x) = 3x^2 - 5x$ . Evaluate and simplify the difference quotient  $\frac{g(x+h) - g(x)}{h}$ .

(b)[3 points]

Let  $F(x) = 1/\sqrt{x + \sqrt{x}}$ . If  $g(x) = x^2 + x$ , determine functions  $f$  and  $h$  so that  $F = f \circ g \circ h$ .

**Question 3:**

(a)[5 points] Evaluate the following limit if it exists:  $\lim_{x \rightarrow 2} \frac{x^2 + 2x - 8}{x^4 - 16}$

(b)[5 points] Evaluate the following limit if it exists (the Squeeze Theorem may be useful):

$$\lim_{x \rightarrow 0} \sqrt{x^3 + x^2} \sin\left(\frac{3}{x}\right).$$

**Question 4:**

(a)[5 points] Evaluate the following limit if it exists:  $\lim_{t \rightarrow 5} \frac{\sqrt{44+t} - 7}{5-t}$

(b)[5 points] Evaluate the following limit if it exists:  $\lim_{\theta \rightarrow 0} \frac{\sin(2\theta) - \theta}{\sin(3\theta)}$

**Question 5:**

(a)[5 points] Evaluate the following limit if it exists:  $\lim_{x \rightarrow -\infty} \frac{-2x^3 - 7x + \pi}{9x^3 + 11x^2 - \pi x + \sqrt{2}}$

(b)[5 points] Use the Intermediate Value Theorem to show that the equation  $2 \sin x = \pi - 2x$  has a solution on the interval  $[0, \pi]$ .