Directions. Answer the questions in the space provided. Unless noted otherwise, you must show and explain your work to receive full credit. Put your final answer in a box when appropriate.

This is a closed-book, closed-notes test. Calculators, computers, etc., are not used.

(a) \( \tan \left( \frac{5\pi}{3} \right) = \) 

(b) Describe the domain of \( f(x) = \frac{x + 1}{x\sqrt{x + 5}} \).

(c) Suppose \( h(x) = \frac{\sin(\sqrt{x})}{\sqrt{x}} \).

State functions \( f(x) \) and \( g(x) \) for which \( h(x) = f \circ g(x) \).

(d) \( \lim_{x \to 3} \left( \frac{x^2 - 1}{x^3} \right)^{\frac{2}{3}} = \)

(e) \( \lim_{x \to \frac{\pi}{2}^+} \tan(x) = \)
2. (15 points) Consider the equation \(2 \sin^2(x) = -\sin(x)\).

Find all solutions \(x\) of this equation for which \(0 \leq x \leq 2\pi\).
3. (15 points) Evaluate the following limits.

(a) \[ \lim_{x \to 2} \frac{\sin(2x - 4)}{5x - 10} = \]

(b) \[ \lim_{h \to 0} \frac{\sqrt{4 + h} - 2}{h} = \]

(c) \[ \lim_{x \to 3} \frac{1}{x^2} - \frac{1}{9} = \]
4. (15 points) Sketch the graph of any function that meets all of the following criteria.

1. \( f(-1) = 3 \)

2. \( \lim_{x \to \infty} f(x) = -2 \)

3. The line \( y = 3 \) is a horizontal asymptote

4. \( \lim_{x \to 2^+} f(x) = -\infty \) and \( \lim_{x \to 2^-} f(x) = \infty \)

5. \( \lim_{x \to -1} f(x) = 2 \)

6. \( f(x) \) continuous at every \( x \) value except \( x = -1 \) and \( x = 2 \)
5. (15 points) This question concerns the function \( f(x) = \frac{15 - 12x - 3x^2}{50 - 2x^2} \).

(a) State the intervals on which \( f(x) \) is continuous.

(b) Find the horizontal asymptotes (if any).

(c) Find the vertical asymptotes (if any).
6. (15 points) Two functions $f(x)$ and $g(x)$ are graphed below. Answer the following questions.

(a) $\lim_{x \to 3} f(x) =$

(b) Find $c$ if $\lim_{x \to c} f(x) = 0$.

(c) $\lim_{x \to -2} \frac{3f(x)g(x)}{\sqrt{12 + f(x)}} =$

(d) $g \circ f(-2) =$

(e) $\lim_{x \to 3} f(g(x)) =$