Worksheet 3: Chapter 2 (Limits and Continuity)

1. Find the domain of the function $f(x)$ with unknown constant parameter a

$$f(x) = \begin{cases} x^3 - x + 1 & \text{if } x \leq 5/4 \\ 1/2^x & \text{if } 5/4 < x \leq 2 \\ ax + 3 & \text{if } x > 2 \end{cases}$$

(a) Find the limits

$$\lim_{x \to \frac{5}{4}^+} f(x) =$$

$$\lim_{x \to \frac{5}{4}} f(x) =$$

$$\lim_{x \to 2^-} f(x) =$$

$$\lim_{x \to 2} f(x) =$$

(b) Is the function continuous at $x = 5/4$? Explain.

(c) Find the value of a for which the function is continuous at $x = 2$.

2. Find any horizontal, vertical or oblique asymptotes for the following functions.

(a) $f(x) = \dfrac{2x^2 - 2}{x^2 + 4x + 3}$

(b) $g(x) = e^x$

(c) $h(x) = \dfrac{3x^2 - 2x + 1}{x - 1}$

3. For what value c is the following function continuous at $x = 9$?

$$f(x) = \begin{cases} \sqrt{x^2 + 19} - 2 & \text{if } x < 9 \\ c & \text{if } x = 9 \\ x - 1 & \text{if } x > 9 \end{cases}$$