Practice Midterm
AP Calculus AB

Find each of the following limits. If the limit does not exist, explain why.

1. $\lim\limits_{x\to\infty} h(x) =$

2. $\lim\limits_{x\to-\infty} h(x) =$

3. $\lim\limits_{x\to a^+} h(x) =$

4. $\lim\limits_{x\to a^-} h(x) =$

5. $\lim\limits_{x\to a} h(x) =$

6. $\lim\limits_{x\to b} h(x) =$

7. $\lim\limits_{x\to 0} h(x) =$

8. $\lim\limits_{x\to b^+} h(x) =$
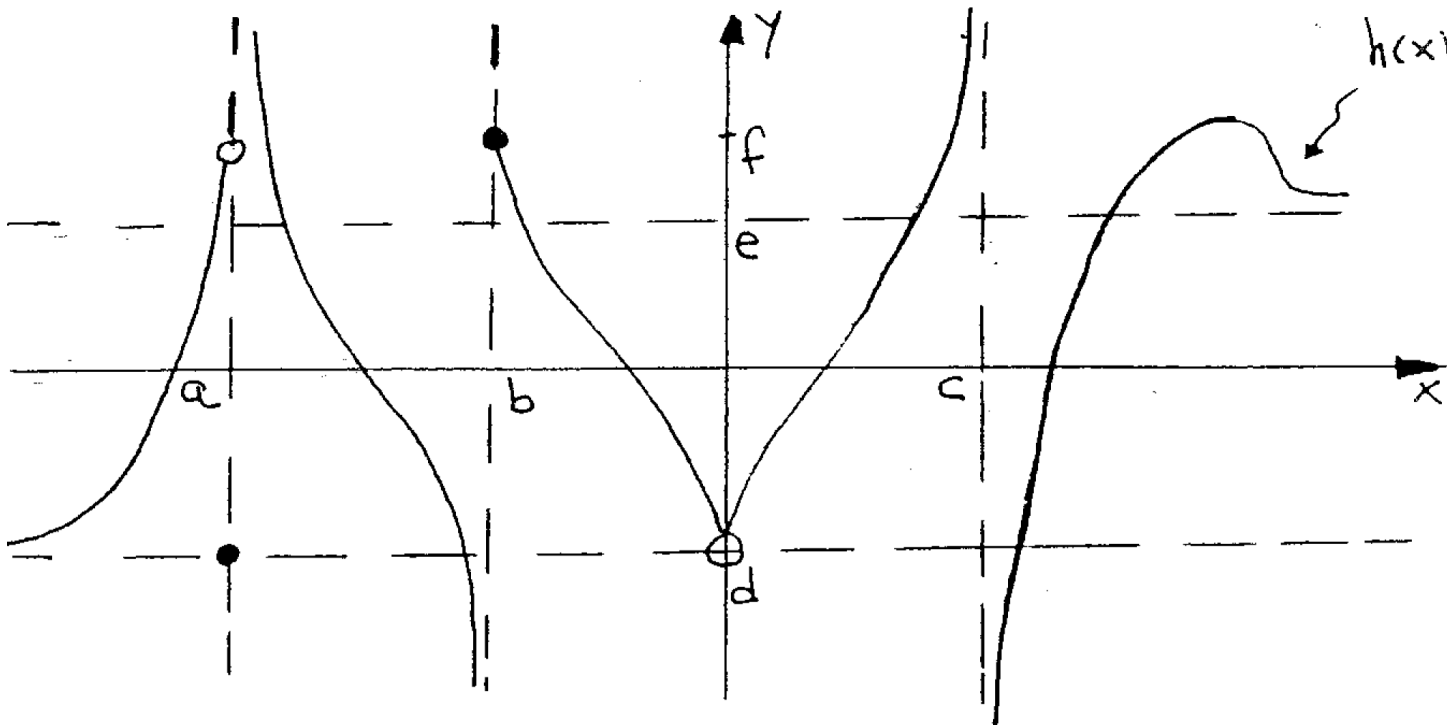
Evaluate each limit. If the limit does not exist, explain why using proper mathematical notation.

12. $\lim\limits_{x\to 5} \dfrac{x^2 + 3x - 40}{2x - 10} =$

13. $\lim\limits_{x\to 5^+} \dfrac{-4x + 1}{2x - 10} =$

14. $\lim\limits_{x\to 5^-} \dfrac{2x - 7}{2x - 10} =$

15. $\displaystyle \lim_{x \to 0} \frac{\sqrt{x+1}-1}{x}$

16. $\displaystyle \lim_{x \to \infty} \frac{-5+3x}{4-3x} =$

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17. $\displaystyle \lim_{x \to -\infty} \frac{-5x^2 - 2x - 3}{-23x - 11 + 6x^4} =$

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18. $\displaystyle \lim_{x \to \infty} \frac{5x^6 - 2x - 1}{3 - 7x^3 - x + 2x^5} =$

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19. Find the equation(s) of the vertical asymptotes of $f(x) = \dfrac{2x - 8}{4x^2 - 64}$. Justify your answer. (with limits)

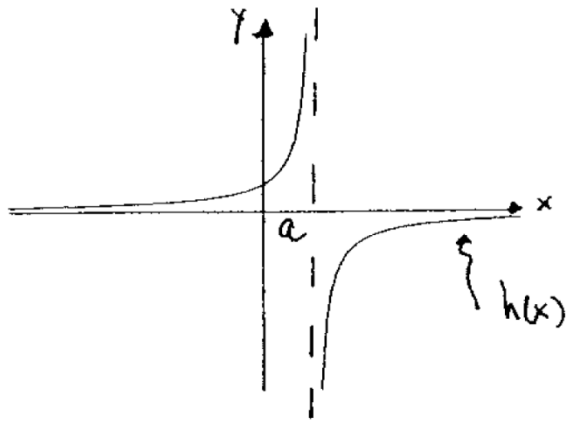20. Find the equation(s) of the horizontal asymptotes of f(x) below. Justify with limits.

$$f(x) = \begin{cases} \dfrac{2x - 3}{50 - 10x}, & \text{if } x > 5 \\[2mm] x^2 - x - 10, & \text{if } x = 5 \\[2mm] \dfrac{-3 - 2x^2 - 10x}{4x^2 - 11x - 7}, & \text{if } x < 5 \end{cases}$$

21. Find the values of a and b so that g(x) is everywhere continuous.
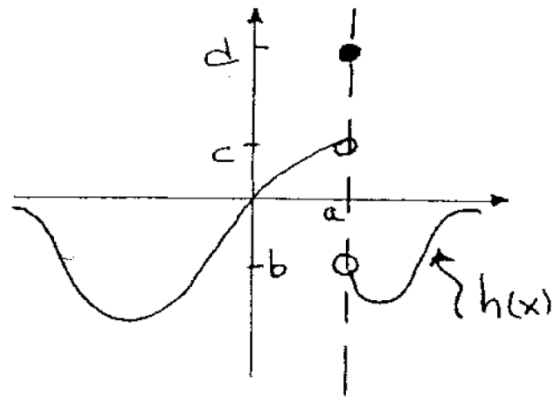
$$g(x) = \begin{cases} x^2, & \text{if } x < 2 \\ ax + b, & \text{if } 2 \le x \le 5 \\ 3x + 1, & \text{if } x > 5 \end{cases}$$

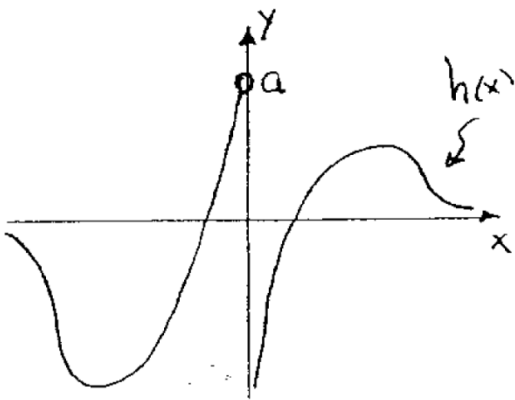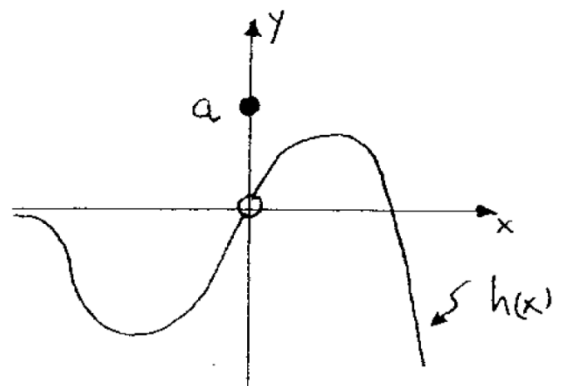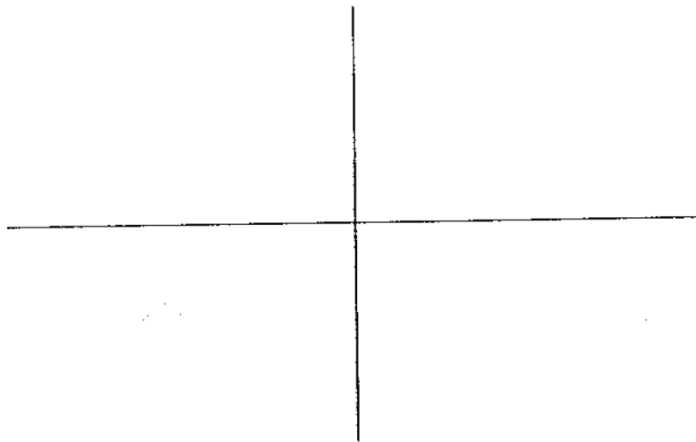For 22-25, classify as jump, removable, or infinite discontinuities. Use limits to justify your answers.

22.

23.

24.

25.

26. Explain why $f(x) = -2x^2 - 5x + 6$ has a root in the interval $[0,1]$.

27. Graph a possible graph for the function H(x) satisfying the following conditions:

$$\lim_{x \to +\infty} H(x) = -1 \quad \lim_{x \to -\infty} H(x) = 5 \quad \lim_{x \to 4^+} H(x) = 4 \quad \lim_{x \to 4^-} H(x) = \infty \quad \text{and} \quad H(-2) = 0$$

Bonus: Find

$$\lim_{x \to \infty} \frac{\dfrac{-5 + 3x}{4 - 3x}}{5x^6 - 2x - 1}{3 - 7x^3 - x + 2x^5}$$