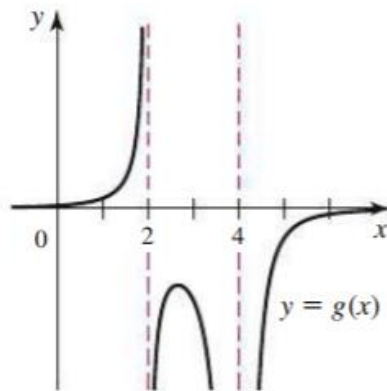**2.4 Group Activity Problems**

4. Consider the function $F(x) = f(x)/g(x)$ with $g(a) = 0$. Does F necessarily have a vertical asymptote at $x = a$? Explain your reasoning.

8. The graph of g in the figure has vertical asymptotes at $x = 2$ and $x = 4$. Analyze the following limits.

   a. $\lim\limits_{x \to 2^-} g(x)$ b. $\lim\limits_{x \to 2^+} g(x)$ c. $\lim\limits_{x \to 2} g(x)$

   d. $\lim\limits_{x \to 4^-} g(x)$ e. $\lim\limits_{x \to 4^+} g(x)$ f. $\lim\limits_{x \to 4} g(x)$

15. Verify that the function $f(x) = \dfrac{x^2 - 4x + 3}{x^2 - 3x + 2}$ is undefined at $x = 1$ and at $x = 2$. Does the graph of f have vertical asymptotes at both these values of x? Explain.

Determine the limits analytically.

22. a. $\displaystyle \lim_{x \to 3^+} \dfrac{2}{(x - 3)^3}$ **b.** $\displaystyle \lim_{x \to 3^-} \dfrac{2}{(x - 3)^3}$ **c.** $\displaystyle \lim_{x \to 3} \dfrac{2}{(x - 3)^3}$

28. a. $\displaystyle \lim_{t \to -2^+} \dfrac{t^3 - 5t^2 + 6t}{t^4 - 4t^2}$ **b.** $\displaystyle \lim_{t \to -2^-} \dfrac{t^3 - 5t^2 + 6t}{t^4 - 4t^2}$

    c. $\displaystyle \lim_{t \to -2} \dfrac{t^3 - 5t^2 + 6t}{t^4 - 4t^2}$ **d.** $\displaystyle \lim_{t \to 2} \dfrac{t^3 - 5t^2 + 6t}{t^4 - 4t^2}$

30. **a.** $\displaystyle\lim_{x\to1^+}\frac{x-3}{\sqrt{x^2-5x+4}}$ **b.** $\displaystyle\lim_{x\to1^-}\frac{x-3}{\sqrt{x^2-5x+4}}$

c. $\displaystyle\lim_{x\to1}\frac{x-3}{\sqrt{x^2-5x+4}}$

Finding vertical asymptotes *Find all vertical asymptotes $x = a$ of the following functions. For each value of a, determine* $\displaystyle\lim_{x\to a^+}f(x),\ \lim_{x\to a^-}f(x),\ and\ \lim_{x\to a}f(x).$

$$f(x) = \frac{x+1}{x^3 - 4x^2 + 4x}$$