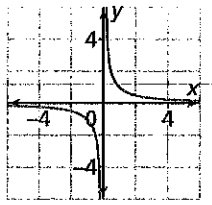
2. Where is each function

i. differentiable?

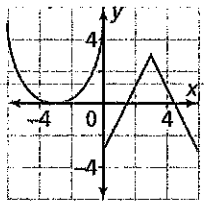
ii. continuous but not differentiable?

iii. neither continuous nor differentiable?

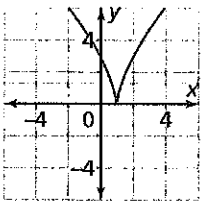
(a)



(b)



(c)



3. Each function is *not* differentiable at $x = 1$. Determine whether the reason is a discontinuity, a corner, a cusp, or a vertical tangent.

(a) $f(x) = \dfrac{x^2 - 1}{x - 1}$

(b) $f(x) = \frac{1}{2}|1 - x| + 1$

(c) $f(x) = \dfrac{x + 4}{x - 1}$

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

(e) $f(x) = 2\sqrt{1 - x}$

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

B 4. Explain why each function is not differentiable at the given x-value(s).

(a) $f(x) = \dfrac{1}{(3 - x)^2}$ at $x = 3$

(b) $f(x) = \dfrac{x - 4}{16 - x^2}$ at $x = \pm 4$

(c) $f(x) = \sqrt[3]{(2x - 5)^2}$ at $x = 2.5$

(d) $f(x) = \frac{2}{3}|4 - 5x| - 1$ at $x = 0.8$

(e) $f(x) = \dfrac{2x - 1}{4x - 9}$ at $x = 2.25$

(f) $f(x) = 5\sqrt{3 - 2x}$ at $x = 1.5$

(g) $f(x) = \sqrt[3]{5 - 4x}$ at $x = 1.25$

(h) $f(x) = \begin{cases} \dfrac{x^2 - 4}{x - 2} & \text{if } x \leq 2 \\ 6 - x & \text{if } x > 2 \end{cases}$

5. **Knowledge and Understanding:** Determine which functions are differentiable at $x = 1$. Give reasons for your choices.

(a) $f(x) = \dfrac{3x}{1 - x^2}$

(b) $g(x) = \dfrac{x - 1}{x^2 + 5x - 6}$

(c) $h(x) = \sqrt[3]{(x - 2)^2}$

(d) $m(x) = |3x - 3| - 1$