Find the derivative by the limit process
(definition of derivative)

Find f'(c) using the alternate form of the derivative

Determine where a function is differentiable.

Find the derivative by the limit process
(definition of derivative)

1. $f(x) = \sqrt{x}$
2. $g(x) = 3x^2 + 4x + 2$
3. $w(x) = \frac{1}{x+2}$

Find the derivative by the limit process
(definition of derivative)

1) $f(x) = \sqrt{x}$

$f'(x) = \frac{1}{2\sqrt{x}}$

2) $g(x) = 3x^2 + 4x + 2$

$g'(x) = 6x + 4$

3) $w(x) = \frac{1}{x+2}$

$w'(x) = \frac{-1}{(x+2)^2}$

3) $$w'(x) = \lim_{h \to 0} \frac{\frac{1(x+2)}{x+h+2} - \frac{1(x+h+2)}{x+2}}{h(x+2)(x+h+2)}$$

$$= \lim_{h \to 0} \frac{\cancel{x}+2-(\cancel{x}+h+2)}{h(x+2)(x+h+2)}$$

$$\lim_{h \to 0} \frac{-1}{(x+2)(x+h+2)}$$

$$\frac{-1}{(x+2)^2}$$

1 $$f'(x) = \lim_{h \to 0} \frac{\sqrt{x+h} - \sqrt{x}}{h} \frac{(\sqrt{x+h} + \sqrt{x})}{(\sqrt{x+h} + \sqrt{x})}$$

$$= \lim_{h \to 0} \frac{\cancel{x} + h - \cancel{x}}{h(\sqrt{x+h} + \sqrt{x})}$$

$$= \lim_{h \to 0} \frac{1}{\sqrt{x+h} + \sqrt{x}}$$

$$= \frac{1}{2\sqrt{x}}$$

Find f'(c) using the alternate form of the derivative (if the limit exists)

4) $f(x) = 10x^2 - 3x + 1$
$c = 1$

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

6) $f(x) = 7x - 4$
$c = 3$

Find f'(c) using the alternate form of the derivative (if the limit exists)

4) $f(x) = 10x^2 - 3x + 1$

$c = 1$ $f'(1) = 17$

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

$c = 2$

dne

6) $f(x) = 7x - 4$

$c = 3$

$f'(3) = 7$

$$f'(1) = \lim_{x \to 1} \frac{10x^2 - 3x + 1 - 8}{x - 1}$$

$$= \lim_{x \to 1} \frac{10x^2 - 3x - 7}{x - 1}$$

$$= \lim_{x \to 1} \frac{\cancel{(x-1)}(10x + 7)}{\cancel{x-1}}$$

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

$$f'(c) = \lim_{x \to c} \frac{f(x) - f(c)}{x - c}$$

$$f'(2) = \lim_{x \to 2} \frac{\sqrt[3]{x-2} - 0}{x-2}$$

$$\frac{(x-2)^{1/3}}{(x-2)^{1}}$$

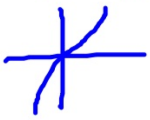
$$= \lim_{x \to 2} \frac{1}{(x-2)^{2/3}} \quad \text{DNE}$$

$$\lim_{x \to 2^-} \frac{1}{(x-2)^{2/3}}$$

$$\frac{1}{(1.9-2)^{2/3}} = \frac{1}{(.1)^{2/3}} \quad \infty$$

Determine where a function is differentiable.
Write in interval notation.

7) $y = x^3$

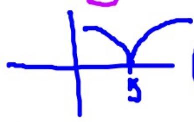


$(-\infty, \infty)$

8) $y = \sqrt{x-6}$

$(6, \infty)$

9) $y = (x-5)^{2/3}$

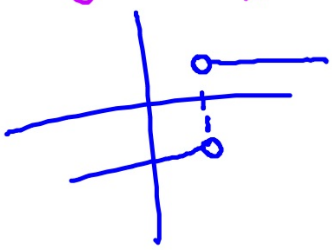


$(-\infty, 5) \cup (5, \infty)$

10) $y = \sqrt[3]{x+5}$

$(-\infty, -5) \cup (-5, \infty)$

11) $y = \dfrac{|x-1|}{x-1}$



$(-\infty, 1) \cup (1, \infty)$

12) $y = \dfrac{2}{x-1}$

$(-\infty, 1) \cup (1, \infty)$

Determine where a function is differentiable.
Write in interval notation.

7 $y = x^3$

8 $y = \sqrt{x-6}$

9 $y = (x-5)^{2/3}$

10 $y = \sqrt[3]{x+5}$

11 $y = \frac{|x-1|}{x-1}$

12 $y = \frac{2}{x-1}$