Determine the limit by substitution. (SHOW WORK.)

1) $\lim\limits_{x \to 0} \dfrac{x^3 - 6x + 8}{x - 2} = \dfrac{0^3 - 6(0) + 8}{0 - 2} = \dfrac{8}{-2} = -4$

Determine the limit algebraically, if it exists. (SHOW WORK.)

2) $\lim\limits_{x \to -6} \dfrac{x^2 - 36}{x + 6} = \lim\limits_{x \to -6} \dfrac{\cancel{(x+6)}(x-6)}{\cancel{x+6}}$

$= \lim\limits_{x \to -6} (x-6) = -6-6 = -12$

3) $\lim\limits_{x \to 0} \dfrac{7 \sin x}{4x}$ (SHOW WORK.)

$= \lim\limits_{x \to 0} \left(\dfrac{7}{4}\right)\left(\dfrac{\sin x}{x}\right)$

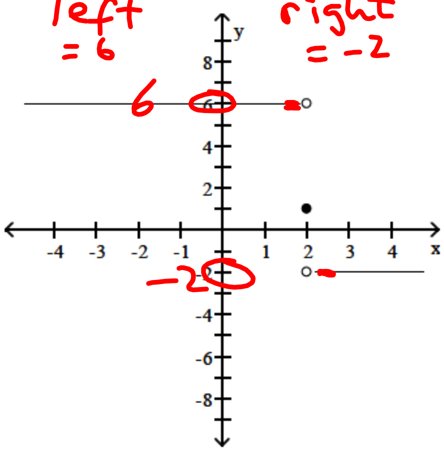
$= \lim\limits_{x \to 0} \left(\dfrac{7}{4}\right) \cdot \underbrace{\lim\limits_{x \to 0} \left(\dfrac{\sin x}{x}\right)}_{1}$

$= \dfrac{7}{4}$

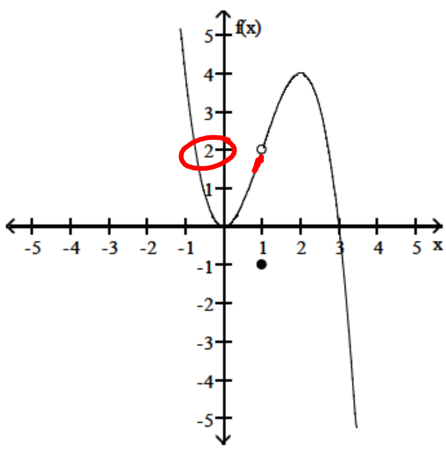
Determine the limit graphically, if it exists.

4) Find $\lim\limits_{x \to 2^-} f(x)$ and $\lim\limits_{x \to 2^+} f(x)$.

left $= 6$ right $= -2$



5) $\lim\limits_{x \to 1^-} f(x)$ 2



6) Let $\lim_{x \to 8} f(x) = -7$ and $\lim_{x \to 8} g(x) = -4$. Find $\lim_{x \to 8} [f(x) \cdot g(x)]$.

$$= \lim_{x \to 8} f(x) \cdot \lim_{x \to 8} g(x) = (-7) \cdot (-4) = 28$$

7) Let $\lim_{x \to 5} f(x) = 3$ and $\lim_{x \to 5} g(x) = 1$. Find $\lim_{x \to 5} \frac{6f(x) - 3g(x)}{5 + g(x)}$. **(SHOW WORK.)**

✓

Find the limit, if it exists.

8) $\lim_{x \to \infty} \frac{x^2 \cancel{+ 3x + 19}}{x^3 \cancel{+ 2x^2 + 10}} = \lim_{x \to \infty} \frac{1}{x} = 0$

9) $\lim_{x \to \infty} \frac{4x \cancel{+ 1}}{13x \cancel{- 7}} = \lim_{x \to \infty} \frac{4x}{13x} = \lim_{x \to \infty} \frac{4}{13} = \frac{4}{13}$

10) $\lim_{x \to (-2)^-} \frac{1}{x + 2}$ infinite discontinuity @ $x = -2$

let $x = -2.0001$

$\frac{1}{x+2} = \frac{1}{-2.0001 + 2} = \frac{1}{-.0001}$

$= -10{,}000$

$= -\infty$

Find the vertical asymptotes of the graph of f(x).

11) $f(x) = \dfrac{x}{x+4}$ aka infinite discont.

$x + 4 = 0$ or $x = -4$

Find all values of x where the function is discontinuous.

12)

$$f(x) = \begin{cases} \dfrac{x^2 - 9}{x + 3}, & x \neq -3 \\ 8, & x = -3 \end{cases}$$

$$\frac{\cancel{(x+3)}(x-3)}{\cancel{x+3}}$$

this is f(x) when $x \neq -3$

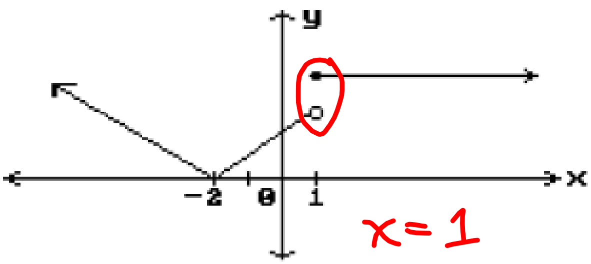
$$\lim_{x \to -3} (x-3) \stackrel{?}{=} f(-3)$$

$$-3-3 \stackrel{?}{=} 8$$ discont. @ $x=-3$

NO.

Find all values of x where the function is discontinuous.

13)



$x = 1$

Find the average rate of change of the function over the given interval. (SHOW WORK.)

14) $f(x) = e^x$, $[-4, 0]$ $a = -4$ $b = 0$

$$\frac{f(b) - f(a)}{b - a} = \frac{e^0 - e^{-4}}{0-(-4)} = \frac{1 - e^{-4}}{4}$$

Find the equation for the tangent to the curve at the given point. **<u>(SHOW WORK.)</u>**

15) $f(x) = 3 - x^2$ at $x = 5$ where slope of curve at $x = 5$ is -10

$x_1 = 5$

$y_1 = 3 - (5)^2 = 3 - 25 = -22$

$m = -10$

$y = y_1 + m(x - x_1)$

$y = -22 - 10(x - 5)$

$= -22 - 10x + 50$

$y = -10x + 28$

position: $s(t)$ (sometimes)

on AP test: "particle moves along x-axis with position fcn $x(t) = \ldots$"

dep. indep.

x is a fcn of t

p. 124 #30

hint: power rule

$$\frac{d}{dx}(x^n) = n \cdot x^{n-1}$$

hint: $\frac{x^{-6}}{3} = \frac{1}{3} \cdot x^{-6}$

so: $\frac{d}{dx}\left(\frac{1}{3}x^{-6}\right) = \frac{1}{3} \cdot (-6x^{-7})$

$= -2x^{-7}$

#31 hint: $\sqrt{x} = x^{1/2}$

$$\frac{d}{dx}(\sqrt{x} + 1)$$

$$= \frac{d}{dx}(x^{1/2} + 1)$$

$$= \frac{d}{dx}(x^{1/2}) + \frac{d}{dx}(1)$$

$$= \frac{1}{2}x^{-1/2} + 0$$

$$= \frac{1}{2x^{1/2}}$$

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