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SECTION 2.2 LIMIT OF A FUNCTION

(2)

$\lim_{x \to 1^-} f(x) = 3$, AS X APPROACHES 1 FROM THE LEFT THE LIMIT OF $f(x)$ IS 3

$\lim_{x \to 1^+} f(x) = 7$, AS X APPROACHES 1 FROM THE RIGHT THE LIMIT OF $f(x)$ IS 7

THE LIMIT DOES NOT EXIST BECAUSE THE LEFT- AND RIGHT-HAND LIMITS ARE DIFFERENT.

(5) a) $\lim_{x \to 1^-} f(x) = \boxed{2}$

b) $\lim_{x \to 1^+} f(x) = \boxed{3}$

c) $\lim_{x \to 1} f(x) = \boxed{\text{DOES NOT EXIST}}$

d) $\lim_{x \to 5} f(x) = \boxed{4}$

e) $f(5) = \boxed{\text{UNDEFINED}}$

(7) a) $\lim_{t \to 0^-} g(t) = \boxed{-1}$

b) $\lim_{t \to 0^+} g(t) = \boxed{-2}$

c) $\lim_{t \to 0} g(t) = \boxed{\text{DOES NOT EXIST}}$

d) $\lim_{t \to 2^-} g(t) = \boxed{2}$

e) $\lim_{t \to 2^+} g(t) = \boxed{0}$

f) $\lim_{t \to 2} g(t) = \boxed{\text{DOES NOT EXIST}}$

g) $g(2) = \boxed{1}$

h) $\lim_{t \to 4} g(t) = \boxed{3}$

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(9) a) $\lim_{x \to -7} f(x) = \boxed{-\infty}$

b) $\lim_{x \to -3} f(x) = \boxed{\infty}$

c) $\lim_{x \to 0} f(x) = \boxed{\infty}$

d) $\lim_{x \to 6^-} f(x) = \boxed{-\infty}$

e) $\lim_{x \to 6^+} f(x) = \boxed{\infty}$

f) VERTICAL ASYMPTOTES

$x = -7$

$x = -3$

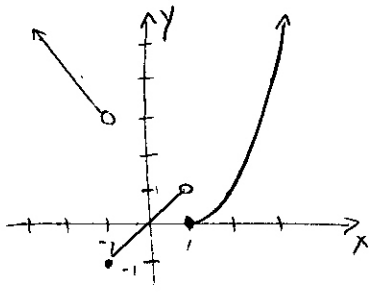
$x = 0$

$x = 6$

(12) SKETCH

$$f(x) = \begin{cases} 2-x & \text{if } x < -1 \\ x & \text{if } -1 \le x < 1 \\ (x-1)^2 & \text{if } x \geq 1 \end{cases}$$

FIND WHERE $\lim_{x \to a} f(x)$ EXISTS



$\lim_{x \to a} f(x)$ EXISTS FOR ALL a, EXCEPT $a = -1$, $a = 1$

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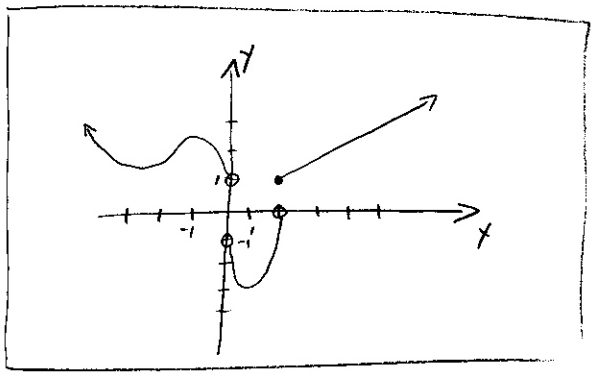
(14) SKETCH A GRAPH THAT SATISFIES:

$\lim_{x \to 0^-} f(x) = 1$ $\quad \lim_{x \to 2^-} f(x) = 0$ $\quad f(2) = 1$

$\lim_{x \to 0^+} f(x) = -1$ $\quad \lim_{x \to 2^+} f(x) = 1$ $\quad f(0)$ UNDEFINED



(19) $\lim_{x \to 0} \frac{e^x - 1 - x}{x^2}$

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

$f(1) = \frac{e^1 - 1 - 1}{1^2} = \boxed{0.718282}$ $\quad f(-1) = \frac{e^{-1} - 1 - (-1)}{(-1)^2} = \boxed{0.367879}$

$f(0.5) = \frac{e^{.5} - 1 - 0.5}{(.5)^2} = \boxed{.594885}$ $\quad f(-0.5) = \frac{e^{-.5} - 1 - (-0.5)}{(-0.5)^2} = \boxed{.426123}$

$f(0.1) = \frac{e^{.1} - 1 - 0.1}{(0.1)^2} = \boxed{0.517092}$ $\quad f(-0.1) = \frac{e^{-0.1} - 1 - (-0.1)}{(-0.1)^2} = \boxed{0.483742}$

$f(0.05) = \frac{e^{0.05} - 1 - 0.05}{(0.05)^2} = \boxed{0.508439}$ $\quad f(-0.05) = \frac{e^{-0.05} - 1 - (-0.05)}{(-0.05)^2} = \boxed{0.49177}$

$f(0.01) = \frac{e^{0.01} - 1 - 0.01}{(0.01)^2} = \boxed{.501671}$ $\quad f(-0.01) = \frac{e^{-0.01} - 1 - (-0.01)}{(-0.01)^2} = \boxed{0.49833}$

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(25) $\lim_{x \to -3^+} \frac{x+2}{x+3} = -\infty$

BECAUSE THE NUMERATOR IS NEGATIVE AND THE DENOMINATOR IS APPROACHING 0 FROM POSITIVE SIDE AS $x \to -3^+$

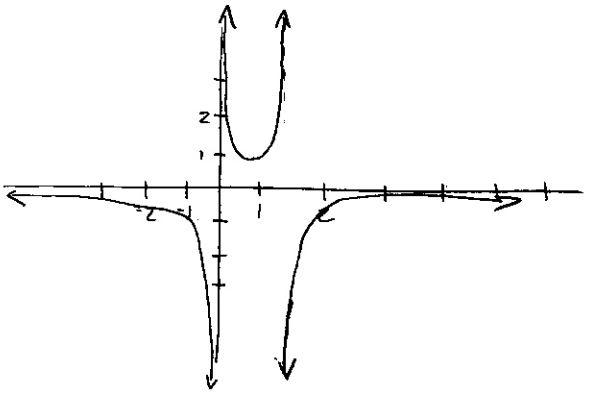
(34) FIND THE VERTICAL ASYMPTOTES OF $y = \frac{x^2+1}{3x-2x^2}$

$$3x - 2x^2 = 0$$

$$x(3-2x)$$

ASYMPTOTES WHEN $x = 0$ AND $x = \frac{3}{2}$

GRAPH $y = \frac{x^2+1}{3x-2x^2}$



(40) $\lim_{v \to c^-} m$

$$\lim_{v \to c^-} \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} = \infty$$

AS $v \to c^-$, $\sqrt{1 - \frac{v^2}{c^2}} \to 0^+$, $\therefore m \to \infty$

AS THE VELOCITY OF THE PARTICLE APPROACHES THE SPEED OF LIGHT THE MASS OF THE PARTICLE GROWS TO INFINITY