IVT, EVT, and Review

1) $f(x) = x^3 + x$ is cont. on $[1,2]$
IVT applies

$f(1) = 2 < 9$
$f(2) = 10 > 9$

$f(x) = 9$ in $(1,2)$

2) $g(t) = \frac{t}{t+2}$ is cont on $[0,2]$

IVT applies

$g(0) = 0 < 0.499$
$g(2) = \frac{1}{2} > 0.499$

$g(t) = 0.499$ in $(0,2)$

3) $f(x) = x^3 + 2x + 1$ is cont on $[-1,0]$
IVT applies
$f(-1) = -2 < 0$
$f(0) = 1 > 0$

$f(x) = 0$ in $(-1, 0)$

4) $f(x)$ is cont. on $[0,5]$, IVT appl

$\left.\begin{array}{l} f(0) = 1 > 0 \\ f(1) = -5 < 0 \end{array}\right\} f(x) = 0$ in $(0,1)$

$\left.\begin{array}{l} f(2) = -4 < 0 \\ f(3) = 2 > 0 \end{array}\right\} f(x) = 0$ in $(2,3)$

$\left.\begin{array}{l} f(3) = 2 > 0 \\ f(4) = -10 < 0 \end{array}\right\} f(x) = 0$ in $(3,4)$

$f(x) = 0$ at least 3 times

5) $\lim\limits_{x \to 4} (3 + \sqrt{x}) = 5$

6) $\lim\limits_{x \to 1} \frac{5 - x^2}{4x + 7} = \frac{4}{11}$

7) $\lim\limits_{x \to -1} \frac{3x^2 + 4x + 1}{x + 1}$

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

$\lim\limits_{x \to -1} (x + 1) = 0$

L'H Rule

$\lim\limits_{x \to -1} \frac{6x + 4}{1} = -2$

8) $\lim\limits_{t \to 9} \frac{\sqrt{t} - 3}{t - 9}$

$\lim\limits_{t \to 9} (\sqrt{t} - 3) = 0$ $\lim\limits_{t \to 9} (t - 9) = 0$

$\lim\limits_{t \to 9} \frac{\sqrt{t} - 3}{(\sqrt{t} + 3)(\sqrt{t} - 3)} = \frac{1}{6}$

9) $\lim_{h \to 0} \frac{2(a+h)^2-2a^2}{h}$

$\lim_{h \to 0} \frac{2a^2+4ah+2h^2-2a^2}{h}$

$\lim_{h \to 0} \frac{4ah+2h^2}{h} = \lim_{h \to 0} 4a+2h$

$= 4a$

10) $\lim_{x \to \infty} \frac{9x^2-4}{2x^2-x} = \frac{9}{2}$

11) $\lim_{x \to 3} \frac{x^2-4x-5}{x-3}$

DNE

12) $\lim_{x \to 0^-} \frac{|x|}{x} = -1$

13) $\lim_{x \to 0} \frac{\sin x}{x+1} = 0$

14) $\lim_{x \to \infty} f(x) = 1$

H.A. $y=1$

15) a) $\lim_{x \to b} f(x)$ exists

b) $\lim_{x \to c^-} f(x)$ exists

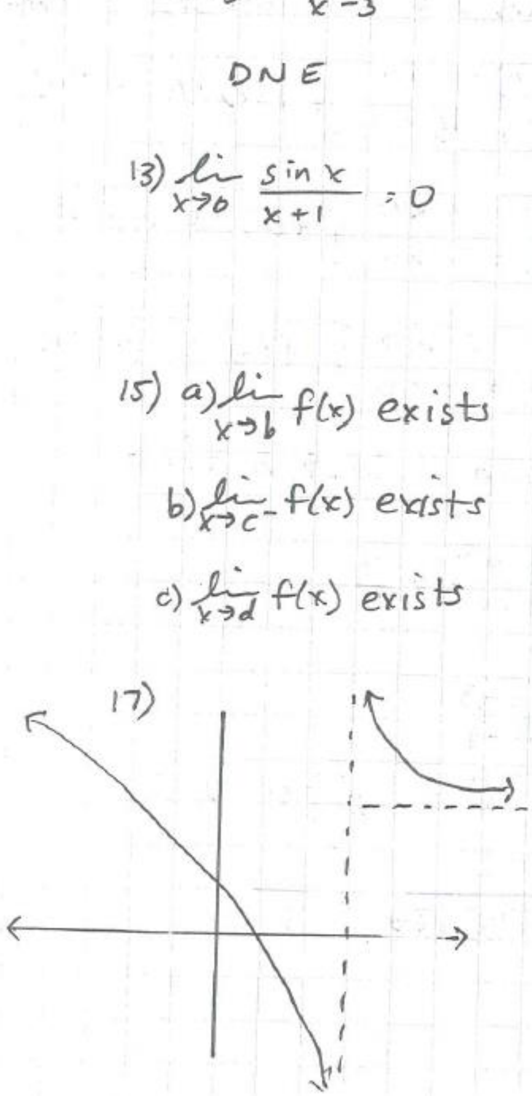
c) $\lim_{x \to d} f(x)$ exists

16) I) $f(1) = -3$

II) $\lim_{x \to 1^-} |x^3-4x| = 3 \neq \lim_{x \to 1^+} (x^2-2x-2) = -3$

$f(x)$ is not cont $x=1$

17)



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

$f(x)$ has an infinite discontinuity @ $x=1$.