michael chillemi exam 1

2. $g(x) = \begin{cases} x & \text{if } x < 1 \\ 5 & \text{if } x = 1 \\ 2-x^2 & \text{if } 1 < x \leq 2 \\ x-1 & \text{if } x > 2 \end{cases}$

a) $\lim_{x \to 1^-} g(x) = 1$

b) $\lim_{x \to 1^+} g(x)$

$2 - x^2$

$2 - 1^2$

$2 - 1 = 1$

c) $g(1) = 5$

d) $\lim_{x \to 2^-} g(x)$

$2 - x^2$

$2 - 2^2$

$2 - 4$

$= -2$

e) $\lim_{x \to 2^+} g(x)$

$x - 1$

$2 - 1 = 1$

f $\lim_{x \to 2} g(x)$

$\lim_{x \to 2^-} g(x) = -2$

DNE

$\lim_{x \to 2^+} g(x) = 1$

3. $F(x) = \dfrac{x^2 - 25}{|x-5|}$

$f(x) \begin{cases} \dfrac{x^2-25}{x-5} & x \geq 5 \\ \dfrac{x^2-25}{-(x-5)} & x < 5 \end{cases}$

$(x-5)(x+5)$

$x^2 + 5x - 5x - 25$

$x^2 - 25$

a $\lim_{x \to 5^+} f(x)$

$\dfrac{5+5}{1} = 10$

$f(x) \begin{cases} \dfrac{(\cancel{x-5})(x+5)}{(\cancel{x-5})} & x \geq 5 & \dfrac{x+5}{1} \\ \dfrac{(\cancel{x-5})(x+5)}{-(\cancel{x-5})} & x < 5 & \dfrac{x+5}{-1} \end{cases}$

b) $\dfrac{x+5}{-1}$ $\dfrac{5+5}{-1}$ -10

c) No not the Same

4. $\lim_{x \to -7} \dfrac{\frac{1}{7} + \frac{1}{x}}{7 + x}$ $\quad \dfrac{\frac{1}{7} + \frac{1}{-7}}{7 + {}^{-}7}$ $\quad \dfrac{0}{0}$

$\lim_{x \to -7} \dfrac{\frac{1}{7} + \frac{1}{x}}{7 + x}$ $\quad \dfrac{\frac{1}{\cancel{7}} \cdot \frac{\cancel{7}x}{1} + \frac{1}{\cancel{x}} \cdot \frac{7\cancel{x}}{1}}{7x(7+x)}$

$\lim_{x \to -7} \dfrac{\cancel{(x+7)}}{7x\cancel{(7+x)}}$ $\quad \dfrac{1}{7x}$ $\quad \lim_{x \to -7} \dfrac{1}{7(-7)} = \dfrac{1}{-49}$

5. $\lim_{x \to 36} \dfrac{(6 - \sqrt{x})}{36x - x^2} \cdot \dfrac{(6 + \sqrt{x})}{(6 + \sqrt{x})}$ $\quad (A - B)(A + B) = A^2 - B^2$

lim $\dfrac{(6^2) - (\sqrt{x}\,\cancel{x})}{(36x - x^2)(6 + \sqrt{x})}$ $\quad \dfrac{\cancel{(36 - x)}}{x\cancel{(36 - x)}(6 + \sqrt{x})}$

$\lim_{x \to 36} \dfrac{1}{x(6 + \sqrt{x})}$ $\quad \dfrac{1}{36(6 + \sqrt{36})}$ $\quad 6 + 6 = 12$

$$\begin{array}{r} {}^{1} \\ 36 \\ \times 12 \\ \hline 72 \\ 360 \\ \hline 432 \end{array}$$

$\dfrac{1}{36(12)}$ $\quad \dfrac{1}{432}$

[redacted]

6. $\lim_{t \to 0} \left(\frac{5}{t} - \frac{5}{t^2+t} \right) \quad \frac{5}{0} - \frac{5}{0} = \frac{0}{0}$

$$\lim_{t \to 0} \left(\frac{5}{t} - \frac{5}{t^2+t} \right) \quad \lim_{t \to 0} \left(\frac{5}{t} - \frac{5}{t(t+1)} \right)$$

$$\left(\frac{(t+1)}{(t+1)} \cdot \frac{5}{t} - \frac{5}{t(t+1)} \right)$$

$$\frac{5(t+1) - 5}{t(t+1)} \qquad \frac{5t + \cancel{5} - \cancel{5}}{t(t+1)} \qquad \frac{5\cancel{t}}{\cancel{t}(t+1)}$$

$$\lim_{t \to 0} \frac{5}{(t+1)} \qquad \lim_{t \to 0} \frac{5}{(0+1)} = 5$$

7. $\lim_{t \to 0} \left(\frac{9}{t\sqrt{1+t}} - \frac{9}{t} \right)$ $\frac{9}{0\sqrt{0+1}} - \frac{9}{0}$ $\frac{0}{0}$

$\lim_{t \to 0} \left(\frac{9}{t\sqrt{1+t}} - \frac{9}{t} \right)$ $\lim_{t \to 0} \left(\frac{9}{t\sqrt{1+t}} - \frac{9}{t} \cdot \frac{\sqrt{1+t}}{\sqrt{1+t}}\right.$

$\lim_{t \to 0} \frac{9 - 9\sqrt{1+t}}{t\sqrt{1+t}}$ | $\lim_{t \to 0}$ $\frac{\cancel{t}\sqrt{1+t}}{1} \cdot \frac{9}{\cancel{t}\sqrt{1+t}}$

$\lim_{t \to 0} \left(\frac{9}{1} - \frac{9\sqrt{1+t}}{1} \right)$ $\lim_{t \to 0} (\cancel{9} - \cancel{9}\sqrt{1+t})$ $\frac{9}{\cancel{t}}$ $\frac{\cancel{t}\sqrt{1+t}}{\cancel{9} \cdot 1}$

$\lim_{t \to 0} (\sqrt{1+t}) = \sqrt{1+0} = \sqrt{1} = 1$

8. $\lim_{x \to -4} \frac{\sqrt{x^2+9}-5}{x+4}$ $\quad \frac{\sqrt{-4^2+9}-5}{-4+4}$ $\quad \frac{5-5}{0} = \frac{0}{0}$

16+9
4

$\lim_{x \to -4} \frac{(\sqrt{x^2+9}-5)}{x+4} \cdot \frac{(\sqrt{x^2+9}+5)}{(\sqrt{x^2+9}+5)}$ $\quad (A-B)(A+B) = A^2 - B^2$

25

$\lim_{x \to -4} \frac{(\sqrt{x^2+9})^2 - (5^2)}{(x+4)(\sqrt{x^2+9}+5)}$ $\quad \lim_{x \to -4} \frac{x^2+9-25}{(x+4)(\sqrt{x^2+9}+5)}$

25 − 9 $\quad$ 25 − 5

20 − 4 $\quad$ 16

$\lim_{x \to -4} \frac{(x^2-16)}{(x+4)(\sqrt{x^2+9}+5)}$ $\quad \lim_{x \to -4} \frac{(x-4)\cancel{(x+4)}}{\cancel{(x+4)}(\sqrt{x^2+9}+5)}$

16 + 9

$\lim_{x \to -4} \frac{(x-4)}{\sqrt{x^2+9}+5} = \frac{(-4+-4)}{\sqrt{(-4)^2+9}+5} = \frac{-8}{\sqrt{25}+5}$

$= \frac{-8}{5+5} = \frac{-8}{10}$

9. $3x - 1 \le f(x) \le x^2 - 3x + 8$ $\quad \lim_{x \to 3}$

$3(3) - 1$ $\quad 3^2 - 3(3) + 8$

$9 - 1$ $\quad \cancel{9} - \cancel{9} + 8$

$8 \le f(x) \le 8$

8

11. $f(x) = \begin{cases} \frac{x^2-4}{x-2} & \text{if } x < 2 \\ ax^2 - bx + 3 & \text{if } 2 \le x < 3 \\ 2x - a + b & \text{if } x \ge 3 \end{cases}$ -1 $\frac{(x-2)(x+2)}{x-2}$ $x=1$

$2(3) - a + b$ $6 + b = a$

$6 - a + b = 0$
$+a \quad +a$

$(6+b)(2^2) - b(2) + 3 = 0$

$(6+b)(4) - 2b + 3 = 0$

$24 + 4b - 2b + 3 = 0$

$24 + 2b + 3 = 0$

$27 + 2b = 0$
$-27 \quad -27$

$\frac{2b}{2} = \frac{-27}{2}$

$b = \frac{-27}{2}$

$\frac{6}{1} - \frac{27}{2} = a$ $27 - 12 = 15$

$\frac{12-27}{2} = a$

$\frac{-15}{2} = a$

$\frac{27}{2} + \frac{-27}{2}$

$2(3) - \frac{15}{2} + \frac{-27}{2}$

$\frac{6}{1} + \frac{15}{2} + \frac{-27}{2}$ $\frac{12}{2} + \frac{15}{2} + \frac{-27}{2}$

12 $\lim_{x \to \infty} (e^{-3x} \cos(x))$

$e^{-3x} \cdot 1$

$\frac{1}{e^{\frac{1}{3}x}} \cdot 1$

13. $\lim_{x \to -\infty} (x^4 + x^5)$

$-1 \cdot -1 \cdot -1 \cdot -1$

$1 \quad -1 \quad -1$

$-1^4 + -1^5$

$1 + -1 \quad 0$

$\lim_{x \to -\infty} x^4(1 + x)$

$\lim_{x \to -\infty}$ ~~(x)^4(1+x)~~ lim

$-2^4(1 + -2)$

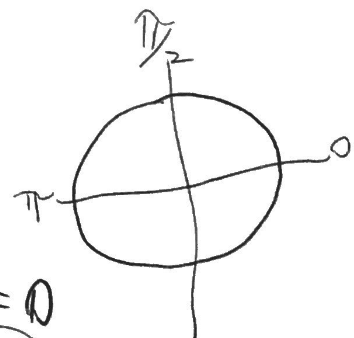
$-2 \cdot -2 \cdot -2 \cdot -2$

$4 \quad -8 \quad 16$

$16 \quad (-1)$

$\lim_{x \to -\infty} -16$

14 $\lim_{x \to \left(\frac{\pi}{2}\right)^+} e^{\tan(x)}$



$\tan(x) = 0$

$e^0 = 1$

$\lim_{x \to \left(\frac{\pi}{2}\right)^+} 1$

15 $\lim_{x \to \pm\infty} f(x) = 0$ H.A. $= 0$

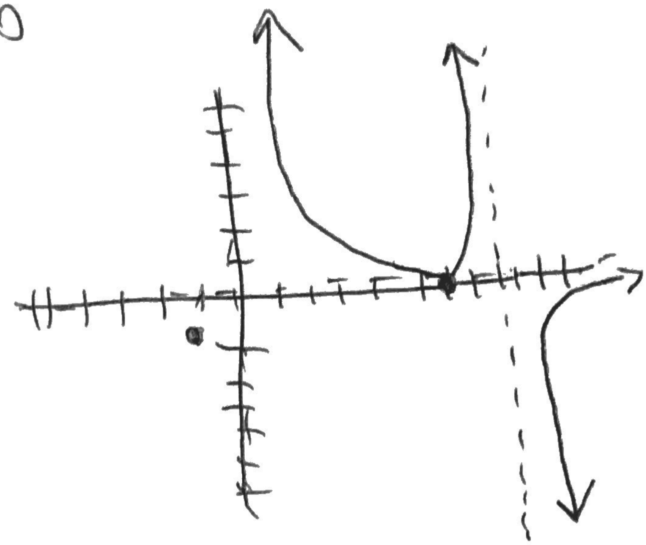
$\lim_{x \to 0} f(x) = -\infty$ V.A. $y = 0$

$f(6) = 0$: $(6, 0)$

$\lim_{x \to 8^-} f(x) = \infty$

V.A. $= 8$

$\lim_{x \to 8^+} f(x) = -\infty$



$f(x) = \dfrac{8-x}{x^2(x-6)}$

16. $y = 8x - x^2$ $(1, 7)$

$1 \cdot 8 - 2x$

$8 - 2x$

$8 - 2$ $m_{tan} = 6$

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

$y - 7 = 6(x - 1)$

$y - 7 = 6x - 6$
$+7 \quad\quad +7$

$y = 6x + 1$

~~No.~~ 20.

sin cos tan
sec csc cot

a $\csc\left(-\frac{\pi}{2}\right)$

$= \frac{1}{2}$

b) $\csc\left(\frac{\pi}{2}\right)$

$= \frac{\sqrt{3}}{2}$

c) $\csc \frac{3}{1}, \frac{1}{2}$

Redo

7. $\lim_{t \to 0} \left(\frac{9}{t\sqrt{1+t}} - \frac{9}{t} \right) = \frac{0}{0}$

$\frac{9}{t\sqrt{1+t}} - \frac{9}{t} \cdot \frac{\sqrt{1+t}}{\sqrt{1+t}}$

$\frac{\cancel{9} - 9\sqrt{1+t}}{t\sqrt{1+t}}$

$\lim_{t \to 0} \frac{\sqrt{1+t}}{t\sqrt{1+t}}$

11.

$x = -2$

13. $\lim_{x \to -\infty} (x^4 + x^5)$

$-\infty$

$\lim_{x \to -\infty}$ -16

$((-2)^4 + (-2)^5) = -16$

14. $\lim_{x \to \left(\frac{\pi}{2}\right)^+} e^{\tan(x)}$

$e^{0} = 0$

$\lim_{x \to \left(\frac{\pi}{2}\right)^+} e^{\tan\left(\frac{\pi}{2}\right)}$ $\quad \tan \frac{\pi}{2} = 0$

20. $\csc\left(\frac{3}{1}\right)\left(\frac{\pi}{2}\right)$

a) $\csc\left(-\frac{\pi}{2}\right) = -1$

b) $\csc\left(\frac{\pi}{2}\right) = 1$

c $\csc\left(\frac{3\pi}{2}\right) = -1$

$\frac{3}{1} \cdot \frac{\pi}{2}$ $\frac{\pi}{2} = 1$

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12 $\lim_{x \to \infty} \left(e^{-3x} \cos(x)\right)$

$x = 0$

$\cos(x) = 1$

$e^{0} = 0$

$(0 \cdot 0)$

$\lim_{x \to \infty} \left(e^{-3x} \cos(x)\right) = 0$