Discussion Assignment

Sections 2.3, 2.4, 3.1

Exam 1 Thursday 5/18
covering 2.2, 2.3, 2.4, 3.1, 3.2, ?

section 2.3

(84) $\lim_{x\to 1} \dfrac{x^3+3x^2+5}{4-7x} = \dfrac{1+3+5}{4-7} = \dfrac{9}{-3} = -3$

(90) more for section 2.4. $\lim_{x\to a} \sqrt{g(x)} = \sqrt{\lim_{x\to a} g(x)}$ and

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

$$\lim_{x\to 2} e^{2x-x^2} = e^{\lim_{x\to 2}(2x-x^2)} = e^{4-4} = e^0 = 1.$$

(94) $\lim_{x\to 2} \dfrac{x-2}{x^2-2x} = \lim_{x\to 2} \dfrac{\cancel{x-2}}{x\cancel{(x-2)}} = \lim_{x\to 2} \dfrac{1}{x} = \dfrac{1}{2}$

$\frac{0}{0}$ form

(98) $\lim_{h\to 0} \dfrac{\frac{1}{a+h} - \frac{1}{a}}{h} = \lim_{h\to 0} \dfrac{\frac{1}{a+h}\frac{a}{a} - \frac{1}{a}\frac{a+h}{a+h}}{\frac{h}{1}} = \lim_{h\to 0} \dfrac{\frac{a}{a(a+h)} - \frac{a+h}{a(a+h)}}{\frac{h}{1}}$

$\dfrac{\frac{1}{a} - \frac{1}{a}}{0} = \dfrac{0}{0}$ form

$$= \lim_{h\to 0} \dfrac{\frac{a-(a+h)}{a(a+h)}}{\frac{h}{1}} = \lim_{h\to 0} \dfrac{\frac{-h}{a(a+h)}}{\frac{h}{1}} = \lim_{h\to 0} \frac{-\cancel{h}}{a(a+h)} \frac{1}{\cancel{h}} = \lim_{h\to 0} \frac{-1}{a(a+h)}$$

$$= \frac{-1}{a(a+0)} = \frac{-1}{a^2}$$

Similar example

$$\lim_{x\to 3}\frac{\frac{1}{x}-\frac{1}{3}}{3-x} = \lim_{x\to 3}\frac{\frac{3}{3x}-\frac{x}{3x}}{\frac{3-x}{1}} = \lim_{x\to 3}\frac{\frac{3-x}{3x}}{\frac{3-x}{1}} = \lim_{x\to 3}\frac{\cancel{3-x}}{3x}\cdot\frac{1}{\cancel{3-x}}$$

$\frac{0}{0}$ form

$$= \lim_{x\to 3}\frac{1}{3x} = \frac{1}{9}$$

Recall

$(a-b)(a+b)=a^2-b^2$

(102) $$\lim_{x\to -3}\frac{\sqrt{x+4}-1}{x+3} = \lim_{x\to -3}\frac{\left(\sqrt{x+4}-1\right)}{(x+3)}\frac{\left(\sqrt{x+4}+1\right)}{\left(\sqrt{x+4}+1\right)} = \lim_{x\to -3}\frac{(x+4)-1}{(x+3)\left(\sqrt{x+4}+1\right)}$$

$\frac{0}{0}$ form

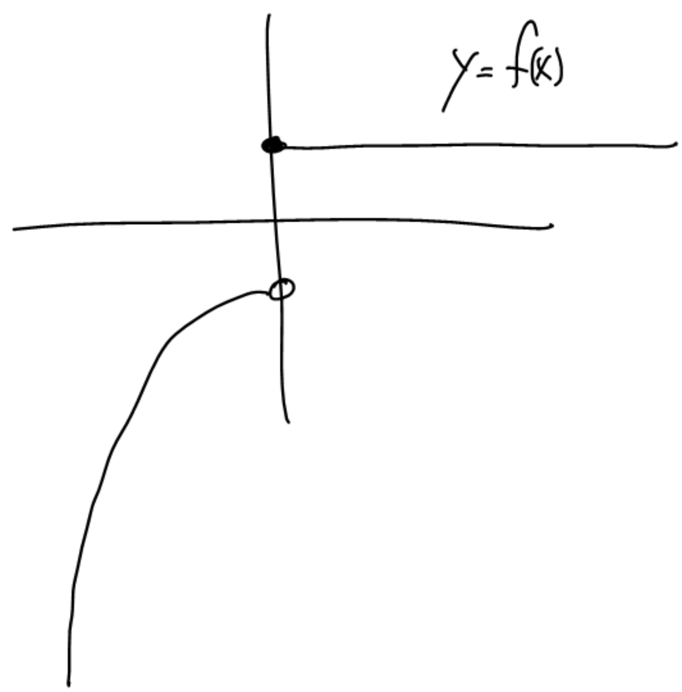
$$= \lim_{x\to -3}\frac{\cancel{x+3}}{\cancel{(x+3)}\left(\sqrt{x+4}+1\right)} = \lim_{x\to -3}\frac{1}{\sqrt{x+4}+1} = \frac{1}{\sqrt{1}+1} = \frac{1}{2}$$

(116) $$f(x)=\begin{cases} x^3-1 & \text{if } x<0 \\ 1 & \text{if } x\geq 0\end{cases}$$

$$\lim_{x\to 0^+} f(x) = \lim_{x\to 0^+} 1 = 1$$

$$\lim_{x\to 0^-} f(x) = \lim_{x\to 0^-}\left(x^3-1\right) = -1$$

$\lim_{x\to 0} f(x)$ does not exist

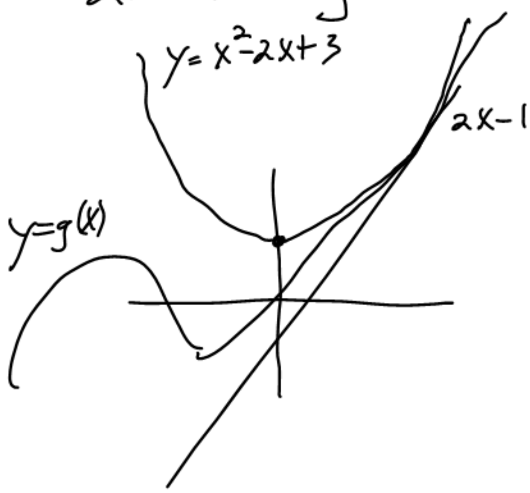


120 $\lim_{x \to 0} \frac{f(x)g(x)}{3} = \frac{(1)(-2.5)}{3} = \frac{-2.5}{3}$

122 $\lim_{x \to 1} [f(x)]^2 = 2^2 = 4$

126 suppose That

$$2x-1 \le g(x) \le x^2-2x+3$$



Therefore $\lim_{x \to 2} (2x-1) \le \lim_{x \to 2} g(x) \le \lim_{x \to 2} (x^2-2x+3)$

$$3 \le \lim_{x \to 2} g(x) \le 3$$

Therefore $\boxed{\lim_{x \to 2} g(x) = 3}$