MATH 149 Homework 5 Solutions

1.3 #26. $f(x) = 2x^2 - 3x + 1 \quad g(x) = \sqrt[3]{x+6}$

a) $\lim_{x \to 4} f(x) = 2 \cdot 4^2 - 3 \cdot 4 + 1 = 21$

b) $\lim_{x \to 21} g(x) = \sqrt[3]{21+6} = 3$

c) $\lim_{x \to 4} g(f(x)) = g\left(\lim_{x \to 4} f(x)\right) = g(21) = 3.$

#28. $\lim_{x \to \pi} \tan x = \tan \pi = 0$

#46. $\lim_{x \to -1} \dfrac{2x^2 - x - 3}{x+1} \xrightarrow[\text{plug in } x=-1]{} \dfrac{0}{0}$ needs work!

$\lim_{x \to -1} \dfrac{(2x-3)\cancel{(x+1)}}{\cancel{(x+1)}} = \lim_{x \to -1} 2x - 3 = -6$

#48. $\lim_{x \to -1} \dfrac{x^3+1}{x+1} \to \dfrac{0}{0}$ needs work (Recall $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$)

$\lim_{x \to -1} \dfrac{\cancel{(x+1)}(x^2 - x + 1)}{\cancel{(x+1)}} = \lim_{x \to -1} x^2 - x + 1 = 3.$

#58. $\lim_{x \to 0} \dfrac{\frac{1}{x+4} - \frac{1}{4}}{x} = \lim_{x \to 0} \dfrac{\frac{4-(x+4)}{4(x+4)}}{x} = \lim_{x \to 0} \dfrac{-\cancel{x}}{4(x+4)} \cdot \dfrac{1}{\cancel{x}}$

$= \lim_{x \to 0} \dfrac{-1}{4(x+4)} = \dfrac{-1}{16}.$

#54. $\lim_{x \to 0} \dfrac{\sqrt{2+x} - \sqrt{2}}{x} = \lim_{x \to 0} \dfrac{(\sqrt{2+x} - \sqrt{2})(\sqrt{2+x} + \sqrt{2})}{x(\sqrt{2+x} + \sqrt{2})}$

$= \lim_{x \to 0} \dfrac{\cancel{2} + \cancel{x} - \cancel{2}}{\cancel{x}(\sqrt{2+x} + \sqrt{2})} = \lim_{x \to 0} \dfrac{1}{\sqrt{2+x} + \sqrt{2}} = \dfrac{1}{2\sqrt{2}}.$

#70. $\lim_{\theta \to 0} \dfrac{\cos\theta \tan\theta}{\theta} = \lim_{\theta \to 0} \dfrac{\cancel{\cos\theta} \frac{\sin\theta}{\cancel{\cos\theta}}}{\theta} =$

$= \lim_{\theta \to 0} \dfrac{\sin\theta}{\theta} = 1.$

#78. $\lim_{x \to 0} \dfrac{\sin 2x}{\sin 3x} = \lim_{x \to 0} \dfrac{\sin 2x}{2x} \cdot 2\cancel{x} \cdot \dfrac{3x}{\sin 3x} \cdot \dfrac{1}{3\cancel{x}} = \dfrac{2}{3}$