HW 9.2 Day 1
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#2-10 even

(2) $\lim_{x\to 0} \frac{\sin(5x)}{x} = 5$

check: $\frac{\sin(5\cdot 0)}{0} = \frac{0}{0}$: can use l'Hôsp. Rule

$\lim_{x\to 0} \frac{\sin(5x)}{x} = \frac{\cos(5\cdot 0)\cdot 5}{1} = \frac{1\cdot 5}{1} = \boxed{5}$ ✓

(4) $\lim_{x\to 1} \frac{\sqrt[3]{x}-1}{x-1} = \frac{1}{3}$

check: $\frac{\sqrt[3]{1}-1}{1-1} = \frac{0}{0}$: can use l'Hôsp. Rule

$\lim_{x\to 1} \frac{\sqrt[3]{x}-1}{x-1} = \frac{\frac{1}{3}(1)^{-\frac{2}{3}}}{1} = \frac{1}{3}$ ✓

(6) $\lim_{\theta\to \frac{\pi}{2}} \frac{1-\sin\theta}{1+\cos(2\theta)} = \frac{1-\sin\frac{\pi}{2}}{1+\cos(\pi)} = \frac{0}{0}$

can use l'Hôspital's Rule

$\lim_{\theta\to \frac{\pi}{2}} \frac{1-\sin\theta}{1+\cos(2\theta)} = \lim_{\theta\to \frac{\pi}{2}} \frac{-\cos\theta}{-2\sin(2\theta)} = \frac{\sin\frac{\pi}{2}}{-4\cos(2\cdot\frac{\pi}{2})} = \boxed{\frac{1}{4}}$

still $\frac{0}{0}$

(8) $\lim_{x\to 2} \frac{x^2-4x+4}{x^3-12x+16} = \frac{2^2-4(2)+4}{2^3-12(2)+16} = \frac{0}{0}$ Can use l'Hôsp. Rule

$= \lim_{x\to 2} \frac{2x-4}{3x^2-12} = \frac{2(2)-4}{3(2)^2-12} = \frac{0}{0}$ L.R. again

$= \lim_{x\to 2} \frac{2}{6x} = \frac{2}{6(2)} = \boxed{\frac{1}{6}}$

(10) a) $\lim_{x\to 0^-} \frac{\tan x}{x} = \frac{0}{0}$ Apply l'Hôsp. Rule

$= \lim_{x\to 0^-} \frac{\sec^2 x}{1} = \frac{\sec^2 0}{1} = \boxed{1}$

b) $\lim_{x\to 0^+} \frac{\tan x}{x} = \frac{0}{0}$ Apply L.R.

$= \lim_{x\to 0^+} \frac{\sec^2 x}{1} = \boxed{1}$