HW (7.7) pp. 530-531 #5-15: odds
#18, #19, #23, #24, #25, #26, #29, #30

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#5 $\lim_{x\to 3} \frac{2(x-3)}{x^2-9}$

@ Method #1:

$\lim_{x\to 3} \frac{2(x-3)}{x^2-9} = \lim_{x\to 3} \frac{2(x-3)}{(x+3)(x-3)}$

$= \lim_{x\to 3} \frac{2}{x+3} = \frac{2}{6} = \frac{1}{3}$

(b) Method #2 : L'Hôpital's

$\lim_{x\to 3} = \lim_{x\to 3} \frac{2}{2x} = \frac{2}{6} = \frac{1}{3}$

#7 $\lim_{x\to 3} \frac{\sqrt{x+1}-2}{x-3}$

@ Method #1 :

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

(b) Method #2 : L'Hôpital's Rule

$\lim_{x\to 3} = \lim_{x\to 3} \frac{\frac{1}{2\sqrt{x+1}}}{1} = \frac{1}{4}$

#9 $\lim_{x\to\infty} \frac{5x^2-3x+1}{3x^2-5}$

@ Method #1:

$\lim_{x\to\infty} = \lim_{x\to\infty} \frac{5-(3/x)+(1/x^2)}{3-(5/x^2)} = \frac{5}{3}$

(b) Method #2: L'Hôpital's Rule

$\lim_{x\to\infty} = \lim_{x\to\infty} \frac{10x-3}{6x} = \lim_{x\to\infty} \frac{10}{6}$

$= \frac{5}{3}$

#11 $\lim_{x\to 2} \frac{x^2-x-2}{x-2}$

<Apply L'Hôpital's>

$= \lim_{x\to 2} \frac{2x-1}{1} = 4-1 = 3$

#13 $\lim_{x\to 0} \frac{\sqrt{4-x^2}-2}{x}$

<L'Hôpital's>

$= \lim_{x\to 0} \frac{\frac{-x}{\sqrt{4-x^2}}}{1} = \frac{0}{\sqrt{4}} = 0$

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#15 $\lim_{x\to 0} \dfrac{e^x-(1-x)}{x}$

<Apply L'Hôpital's>

$= \lim_{x\to 0} \dfrac{e^x-0+1}{1}$

$= \lim_{x\to 0} e^x+1 = 1+1 = 2$

#18 $\lim_{x\to 1} \dfrac{\ln(x)}{x^2-1}$

<Apply L'Hôpital's>

$= \lim_{x\to 1} \dfrac{(1/x)}{2x} = \dfrac{1}{2}$

#19 $\lim_{x\to 0} \dfrac{\sin 2x}{\sin 3x}$

<Apply L'Hôpital's>

$= \lim_{x\to 0} \dfrac{2\cos(2x)}{3\cos(3x)} = \dfrac{2(1)}{3(1)} = \dfrac{2}{3}$

#23 $\lim_{x\to\infty} \dfrac{3x^2-2x+1}{2x^2+3}$

<Apply L'Hôpital's>

$= \lim_{x\to\infty} \dfrac{6x-2}{4x}$

<Apply L'Hôpital's>

$= \lim_{x\to\infty} \dfrac{6}{4} = \dfrac{6}{4} = \dfrac{3}{2}$

#24 $\lim_{x\to\infty} \dfrac{x-1}{x^2+2x+3}$

<Apply L'Hôpital's>

$= \lim_{x\to\infty} \dfrac{1}{2x+2} = 0$

#25 $\lim_{x\to\infty} \dfrac{x^2+2x+3}{x-1}$

<Apply L'Hôpital's>

$= \lim_{x\to\infty} \dfrac{2x+2}{1} = \infty$

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#26 $\lim_{x\to\infty} \frac{x^2}{e^x}$

<Apply L'Hôpital's Rule>

$= \lim_{x\to\infty} \frac{2x}{e^x} = \lim_{x\to\infty} = \frac{2}{e^x} = 0$

#29 $\lim_{x\to\infty} \frac{\ln x}{x}$

<Apply L'Hôpital's Rule>

$= \lim_{x\to\infty} \frac{1/x}{1} = 0$

#30 $\lim_{x\to\infty} \frac{e^x}{x}$

<Apply L'Hôpital's>

$= \lim_{x\to\infty} \frac{e^x}{1} = \infty$