MATH 131-03, Fall, 2017 Homework Section 2.6 - 2 - Solutions

Page 137: 36, 40, 42, 48

36. $\lim_{x\to\infty} \dfrac{e^{3x}-e^{-3x}}{e^{3x}+e^{-3x}} \overset{\frac{\infty}{\infty}}{=} \lim_{x\to\infty} \dfrac{e^{3x}}{e^{3x}} = 1$

40. $\lim_{x\to 0^+} \tan^{-1}(\ln(x)) = \tan^{-1}(\lim_{x\to 0^+} \ln(x)) = \tan^{-1}(-\infty) = -\dfrac{\pi}{2}$

42. $\lim_{x\to\infty}(\ln(2+x)-\ln(1+x)) \overset{\infty-\infty}{=} \lim_{x\to\infty} \ln\left(\dfrac{2+x}{1+x}\right) = \ln\left(\lim_{x\to\infty}\left(\dfrac{2+x}{1+x}\right)\right)$
$= \ln(\lim_{x\to\infty}(\frac{x}{x})) = \ln(1) = 0$

48. $y = \dfrac{2x^2+1}{3x^2+2x-1} = \dfrac{2x^2+1}{(3x-1)(x+1)}$

Since $2x^2+1 \neq 0$, y has vertical asymptotes: $x = \dfrac{1}{3}$ and $x = -1$.

Since $\lim_{x\to\infty} \dfrac{2x^2+1}{3x^2+2x-1} \overset{\frac{\infty}{\infty}}{=} \lim_{x\to\infty} \dfrac{2x^2}{3x^2} = \dfrac{2}{3}$ and

$\lim_{x\to-\infty} \dfrac{2x^2+1}{3x^2+2x-1} \overset{\frac{\infty}{\infty}}{=} \lim_{x\to-\infty} \dfrac{2x^2}{3x^2} = \dfrac{2}{3}$

y has horizontal asymptote: $y = \dfrac{2}{3}$