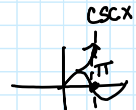
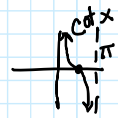
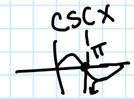
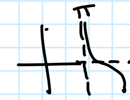
Section 9.2
p. 458
#13-15 odd, 33, 34, 36

(13) $\lim\limits_{x\to\pi} \dfrac{\csc x}{1+\cot x}$









Left: $\lim\limits_{x\to\pi^-} \dfrac{\csc x}{1+\cot x} = \dfrac{\infty}{-\infty}$ L.R. applies

$= \lim\limits_{x\to\pi^-} \dfrac{-\csc x \cot x}{-\csc^2 x}$

$= \lim\limits_{x\to\pi^-} \dfrac{\cot x}{\csc x} = \lim\limits_{x\to\pi^-} \dfrac{\frac{\cos x}{\sin x}}{\frac{1}{\sin x}} =$

$= \lim\limits_{x\to\pi^-} \cos x = \boxed{-1}$

Right: $\lim\limits_{x\to\pi^+} \dfrac{\csc x}{1+\cot x} = \dfrac{-\infty}{\infty}$ L.R. applies

$= \lim\limits_{x\to\pi^+} \cos x = \boxed{-1}$

So $\lim\limits_{x\to\pi} \dfrac{\csc x}{1+\cot x} = \boxed{-1}$

(15) $\lim\limits_{x\to\infty} \dfrac{\ln(x+1)}{\log_2 x} = \dfrac{\infty}{\infty}$ L.R. Applies

$= \lim\limits_{x\to\infty} \dfrac{\frac{1}{x+1}\cdot 1}{\frac{1}{x\ln 2}} = \lim\limits_{x\to\infty} \dfrac{x\ln 2}{x+1} = \dfrac{\infty}{\infty}$ L.R. applies

$= \lim\limits_{x\to\infty} \dfrac{\ln 2}{1} = \boxed{\ln 2}$

(33) $\lim\limits_{\theta\to 0} \dfrac{\sin \theta^2}{\theta} = \dfrac{0}{0}$ L.R. Applies

$= \lim\limits_{\theta\to 0} \dfrac{\cos\theta^2 \cdot 2\theta}{1} = \dfrac{1\cdot 2(0)}{1} = \boxed{0}$

(34) $\lim\limits_{t\to 1} \dfrac{t-1}{\ln t - \sin \pi t} = \dfrac{0}{0-0} = \dfrac{0}{0}$ L.R. Applies

$= \lim\limits_{t\to 1} \dfrac{1}{\frac{1}{t} - \pi\cos\pi t} = \dfrac{1}{1-\pi(-1)}$

$= \boxed{\dfrac{1}{1+\pi}}$

(36) $\lim\limits_{y\to 0^+} \dfrac{\ln(y^2+2y)}{\ln y} = \dfrac{-\infty}{-\infty}$ L.R. applies

$= \lim\limits_{y\to 0^+} \dfrac{\frac{1}{y^2+2y}\cdot(2y+2)}{\frac{1}{y}} = \lim\limits_{y\to 0^+} \dfrac{2y+2}{y^2+2y} \cdot y$

$= \lim\limits_{y\to 0^+} \dfrac{y(2y+2)}{y(y+2)} = \lim\limits_{y\to 0^+} \dfrac{2y+2}{y+2} = \boxed{1}$