

3.5 Limits Involving Infinity and Asymptotes

11. $\lim_{u \rightarrow 4^+} \frac{u^2 + 1}{u - 4} = \infty$ since the numerator approaches 17 and the denominator approaches 0 through positive values as $u \rightarrow 4$ from the right.

17. $\lim_{x \rightarrow (\pi/2)^-} \frac{2}{\cos x} = \infty$ since the numerator is positive and the denominator approaches 0 through positive values as $x \rightarrow \frac{\pi}{2}$ from the left.

25.
$$\begin{aligned} \lim_{x \rightarrow \infty} \left(\frac{x^3}{3x^2 - 2} - \frac{x^2}{3x + 1} \right) &= \lim_{x \rightarrow \infty} \left[\frac{x^3(3x + 1) - x^2(3x^2 - 2)}{(3x^2 - 2)(3x + 1)} \right] = \lim_{x \rightarrow \infty} \frac{x^3 + 2x^2}{(3x^2 - 2)(3x + 1)} \\ &= \lim_{x \rightarrow \infty} \frac{1 + \frac{2}{x}}{\left(3 - \frac{2}{x^2}\right)\left(3 + \frac{1}{x}\right)} = \frac{1}{9} \end{aligned}$$

32.
$$\lim_{t \rightarrow -\infty} \frac{2t^2}{\sqrt{t^4 + t^2}} = \lim_{t \rightarrow -\infty} \frac{2t^2}{\sqrt{t^4 + t^2}} \cdot \frac{\frac{1}{t^2}}{\frac{1}{t^2}} = \lim_{t \rightarrow -\infty} \frac{2}{\sqrt{1 + \frac{1}{t^2}}} = 2$$

4.1 Indefinite Integrals

13.
$$\int \frac{3x^4 - 2x^2 + 1}{x^4} dx = \int (3 - 2x^{-2} + x^{-4}) dx = 3x + 2x^{-1} - \frac{1}{3}x^{-3} + C = 3x + \frac{2}{x} - \frac{1}{3x^3} + C$$

21.
$$\int (\csc^2 x + \sqrt{x}) dx = -\cot x + \frac{2}{3}x^{3/2} + C$$

27.
$$\int \frac{1}{\sin^2 x \cos^2 x} dx = \int \frac{\sin^2 x + \cos^2 x}{\sin^2 x \cos^2 x} dx = \int (\sec^2 x + \csc^2 x) dx = \tan x - \cot x + C$$

28.
$$\int \tan^2 x dx = \int (\sec^2 x - 1) dx = \tan x - x + C$$