15. $\lim_{x\to -2^+}\left(\frac{1}{x+3}-\frac{x}{x+2}\right)=\infty$. As $x\to -2$ from the right, the first term approaches 1 but the second term approaches $-\infty$.

29. $$\lim_{t\to\infty}\left(\frac{t+1}{2t-1}+\frac{2t^2-1}{1-3t^2}\right)=\lim_{x\to\infty}\left(\frac{1+\frac{1}{t}}{2-\frac{1}{t}}+\frac{2-\frac{1}{t^2}}{\frac{1}{t^2}-3}\right)=\frac{1}{2}-\frac{2}{3}=-\frac{1}{6}$$

31. $$\lim_{x\to\infty}\frac{2x}{\sqrt{3x^2+1}}=\lim_{x\to\infty}\frac{2}{\sqrt{3+\frac{1}{x^2}}}=\frac{2}{\sqrt{3}}=\frac{2\sqrt{3}}{3}$$

33. Since $-\frac{1}{|x|}\le\frac{\cos 2x}{x}\le\frac{1}{|x|}$, we apply the Squeeze Theorem to obtain $\lim_{x\to\infty}\frac{\cos 2x}{x}=0$.

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

22. $$\int\sec u\,(\tan u+\sec u)\,du=\int\left(\sec u\tan u+\sec^2 u\right)du=\sec u+\tan u+C$$

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

42. $f'(x)=\int f''(x)\,dx=\int(2x+1)\,dx=x^2+x+C_1$. $f'(0)=1\Rightarrow 0+C_1=1$, so $f'(x)=x^2+x+1$. Then $f(x)=\int f'(x)\,dx=\int\left(x^2+x+1\right)dx=\frac{1}{3}x^3+\frac{1}{2}x^2+x+C_2$. $f(0)=5\Rightarrow 0+C_2=5$ or $C_2=5$. Thus, $f(x)=\frac{1}{3}x^3+\frac{1}{2}x^2+x+5$.