35. As x approaches 3, $1-x$ approaches -2 and $(3-x)^2$ approaches 0 from the right. Therefore, the ratio $\frac{1-x}{(3-x)^2}$ becomes unbounded in the negative direction, so

$$\lim_{x\to 3} \frac{1-x}{(3-x)^2} = \boxed{-\infty}.$$

The values in the table below support this conclusion.

x	2.9	2.99	2.999	$\to 3 \leftarrow$	3.001	3.01	3.1
$f(x) = \frac{1-x}{(3-x)^2}$	-190	-19900	-1999000	$f(x)$ approaches $-\infty$	-2001000	-20100	-210

36. As x approaches -1, $x+2$ approaches 1 and $(x+1)^2$ approaches 0 from the right. Therefore, the ratio $\frac{x+2}{(x+1)^2}$ becomes unbounded in the positive direction, so

$$\lim_{x\to -1} \frac{x+2}{(x+1)^2} = \boxed{\infty}.$$

The values in the table below support this conclusion.

x	-1.1	-1.01	-1.001	$\to -1 \leftarrow$	-0.999	-0.99	-0.9
$f(x) = \frac{x+2}{(x+1)^2}$	90	9900	999000	$f(x)$ approaches ∞	1001000	10100	110

37. As x approaches π from the left, $\cos x$ approaches -1 and $\sin x$ approaches 0 from the right. Therefore, the ratio $\frac{\cos x}{\sin x} = \cot x$ becomes unbounded in the negative direction, so

$$\lim_{x\to \pi^-} \cot x = \boxed{-\infty}.$$

The values in the table below, which have been rounded to two decimal places, support this conclusion.

x	$\pi - 0.1$	$\pi - 0.01$	$\pi - 0.001$	$\to \pi$
$f(x) = \cot x$	-9.97	-100.00	-1000.00	$f(x)$ approaches $-\infty$

38. As x approaches $-\pi/2$ from the left, $\sin x$ approaches -1 and $\cos x$ approaches 0 from the left. Therefore, the ratio $\frac{\sin x}{\cos x} = \tan x$ becomes unbounded in the positive direction, so

$$\lim_{x\to -\pi/2^-} \tan x = \boxed{\infty}.$$

The values in the table below, which have been rounded to two decimal places, support this conclusion.

x	$-\frac{\pi}{2} - 0.1$	$-\frac{\pi}{2} - 0.01$	$-\frac{\pi}{2} - 0.001$	$\to -\pi/2$
$f(x) = \tan x$	9.97	100.00	1000.00	$f(x)$ approaches ∞

39. As x approaches $\pi/2$ from the right, $2x$ approaches π from the right, so $\sin(2x)$ approaches 0 from the left. Therefore, the ratio $\frac{1}{\sin(2x)} = \csc(2x)$ becomes unbounded in the negative direction, so

$$\lim_{x\to \pi/2^+} \csc(2x) = \boxed{-\infty}.$$

The values in the table below, which have been rounded to two decimal places, support this conclusion.

x	$\frac{\pi}{2} \leftarrow$	$\frac{\pi}{2}+0.001$	$\frac{\pi}{2}+0.01$	$\frac{\pi}{2}+0.1$
$f(x)=\csc(2x)$	$f(x)$ approaches $-\infty$	-500.00	-50.00	-5.03

40. As x approaches $-\pi/2$ from the left, $\cos x$ approaches 0 from the left. Therefore, the ratio $\frac{1}{\cos x} = \sec x$ becomes unbounded in the negative direction, so

$$\lim_{x\to -\pi/2^-} \sec x = \boxed{-\infty}.$$

The values in the table below, which have been rounded to two decimal places, support this conclusion.

x	$-\frac{\pi}{2}-0.1$	$-\frac{\pi}{2}-0.01$	$-\frac{\pi}{2}-0.001$	$\to -\pi/2$
$f(x)=\sec x$	-10.02	-100.00	-1000.00	$f(x)$ approaches $-\infty$

41. As x approaches -1 from the right, $x+1$ approaches 0 from the right. Therefore, $\ln(x+1)$ becomes unbounded in the negative direction, so

$$\lim_{x\to -1^+} \ln(x+1) = \boxed{-\infty}.$$

The values in the table below, which have been rounded to two decimal places, support this conclusion.

x	$-1 \leftarrow$	$-1+10^{-6}$	$-1+10^{-4}$	$-1+10^{-2}$
$f(x)=\ln(x+1)$	$f(x)$ approaches $-\infty$	-13.82	-9.21	-4.61

42. As x approaches 1 from the right, $x-1$ approaches 0 from the right. Therefore, $\ln(x-1)$ becomes unbounded in the negative direction, so

$$\lim_{x\to 1^+} \ln(x-1) = \boxed{-\infty}.$$

The values in the table below, which have been rounded to two decimal places, support this conclusion.

x	$1 \leftarrow$	$1+10^{-6}$	$1+10^{-4}$	$1+10^{-2}$
$f(x)=\ln(x-1)$	$f(x)$ approaches $-\infty$	-13.82	-9.21	-4.61

43. $\displaystyle \lim_{x\to\infty} \frac{5}{x^2+4} = \lim_{x\to\infty} \frac{\frac{5}{x^2}}{\frac{x^2+4}{x^2}} = \lim_{x\to\infty} \frac{\frac{5}{x^2}}{1+\frac{4}{x^2}} = \frac{0}{1+0} = \boxed{0}.$

44. $\displaystyle \lim_{x\to-\infty} \frac{1}{x^2-9} = \lim_{x\to-\infty} \frac{\frac{1}{x^2}}{\frac{x^2-9}{x^2}} = \lim_{x\to-\infty} \frac{\frac{1}{x^2}}{1-\frac{9}{x^2}} = \frac{0}{1-0} = \boxed{0}.$

45. $\displaystyle \lim_{x\to\infty} \frac{2x+4}{5x} = \lim_{x\to\infty} \frac{\frac{2x+4}{5x}}{\frac{5x}{5x}} = \lim_{x\to\infty} \frac{\frac{2}{5}+\frac{4}{5x}}{1} = \frac{\frac{2}{5}+0}{1} = \boxed{\frac{2}{5}}.$

46. $\lim_{x\to\infty}\frac{x+1}{x}=\lim_{x\to\infty}\frac{\frac{x+1}{x}}{\frac{x}{x}}=\lim_{x\to\infty}\frac{1+\frac{1}{x}}{1}=\frac{1+0}{1}=\boxed{1}$.

47. $\lim_{x\to\infty}\frac{x^3+x^2+2x-1}{x^3+x+1}=\lim_{x\to\infty}\frac{\frac{x^3+x^2+2x-1}{x^3}}{\frac{x^3+x+1}{x^3}}=\lim_{x\to\infty}\frac{1+\frac{1}{x}+\frac{2}{x^2}-\frac{1}{x^3}}{1+\frac{1}{x^2}+\frac{1}{x^3}}=\frac{1+0+0-0}{1+0+0}=$ $\boxed{1}$.

48. $\lim_{x\to\infty}\frac{2x^2-5x+2}{5x^2+7x-1}=\lim_{x\to\infty}\frac{\frac{2x^2-5x+2}{5x^2}}{\frac{5x^2+7x-1}{5x^2}}=\lim_{x\to\infty}\frac{\frac{2}{5}-\frac{1}{x}+\frac{2}{5x^2}}{1+\frac{7}{5x}-\frac{1}{5x^2}}=\frac{\frac{2}{5}-0+0}{1+0-0}=\boxed{\frac{2}{5}}$.

49. $\lim_{x\to-\infty}\frac{x^2+1}{x^3-1}=\lim_{x\to-\infty}\frac{\frac{x^2+1}{x^3}}{\frac{x^3-1}{x^3}}=\lim_{x\to-\infty}\frac{\frac{1}{x}+\frac{1}{x^3}}{1-\frac{1}{x^3}}=\frac{0+0}{1-0}=\boxed{0}$.

50. $\lim_{x\to\infty}\frac{x^2-2x+1}{x^3+5x+4}=\lim_{x\to\infty}\frac{\frac{x^2-2x+1}{x^3}}{\frac{x^3+5x+4}{x^3}}=\lim_{x\to\infty}\frac{\frac{1}{x}-\frac{2}{x^2}+\frac{1}{x^3}}{1+\frac{5}{x^2}+\frac{4}{x^3}}=\frac{0-0+0}{1+0+0}=\boxed{0}$.

51.

$$\begin{aligned}\lim_{x\to\infty}\left[\frac{3x}{2x+5}-\frac{x^2+1}{4x^2+8}\right] &= \lim_{x\to\infty}\frac{3x}{2x+5}-\lim_{x\to\infty}\frac{x^2+1}{4x^2+8}=\lim_{x\to\infty}\frac{\frac{3x}{2x}}{\frac{2x+5}{2x}}-\lim_{x\to\infty}\frac{\frac{x^2+1}{4x^2}}{\frac{4x^2+8}{4x^2}}\\ &= \lim_{x\to\infty}\frac{\frac{3}{2}}{1+\frac{5}{2x}}-\lim_{x\to\infty}\frac{\frac{1}{4}+\frac{1}{4x^2}}{1+\frac{2}{x^2}}=\frac{\frac{3}{2}}{1+0}-\frac{\frac{1}{4}+0}{1+0}=\frac{3}{2}-\frac{1}{4}=\boxed{\frac{5}{4}}.\end{aligned}$$

52.

$$\begin{aligned}\lim_{x\to\infty}\left[\frac{1}{x^2+x+4}-\frac{x+1}{3x-1}\right] &= \lim_{x\to\infty}\frac{1}{x^2+x+4}-\lim_{x\to\infty}\frac{x+1}{3x-1}=\lim_{x\to\infty}\frac{\frac{1}{x^2}}{\frac{x^2+x+4}{x^2}}-\lim_{x\to\infty}\frac{\frac{x+1}{3x}}{\frac{3x-1}{3x}}\\ &= \lim_{x\to\infty}\frac{\frac{1}{x^2}}{1+\frac{1}{x}+\frac{4}{x^2}}-\lim_{x\to\infty}\frac{\frac{1}{3}+\frac{1}{3x}}{1-\frac{1}{3x}}\\ &= \frac{0}{1+0+0}-\frac{\frac{1}{3}+0}{1-0}=0-\frac{1}{3}=\boxed{-\frac{1}{3}}.\end{aligned}$$