

$$1. \lim_{x \rightarrow 0} \frac{x^2 + 2x - 24}{x^2 - 5x + 4} = \frac{0^2 + 2 \cdot 0 - 24}{0^2 - 5 \cdot 0 + 4} = \frac{-24}{4} = \boxed{-6}$$

$$2. \lim_{x \rightarrow \infty} \frac{x^2 + 2x - 24}{x^2 - 5x + 4} = \lim_{x \rightarrow \infty} \frac{x^2 + 2x - 24}{x^2 - 5x + 4} \cdot \frac{\frac{1}{x^2}}{\frac{1}{x^2}} = \lim_{x \rightarrow \infty} \frac{1 + \frac{2}{x} - \frac{24}{x^2}}{1 - \frac{5}{x} + \frac{4}{x^2}} = \frac{1+0+0}{1+0+0} = \boxed{1}$$

$$3. \lim_{x \rightarrow 4} \frac{x^2 + 2x - 24}{x^2 - 5x + 4} = \lim_{x \rightarrow 4} \frac{(x-4)(x+6)}{(x-4)(x-1)} = \lim_{x \rightarrow 4} \frac{x+6}{x-1} = \frac{4+6}{4-1} = \boxed{\frac{10}{3}}$$

↑ getting $\frac{0}{0}$

$$4. \lim_{x \rightarrow 1^+} \frac{x^2 + 2x - 24}{x^2 - 5x + 4} = \lim_{x \rightarrow 1^+} \frac{(x-4)(x+6)}{(x-4)(x-1)} = \lim_{x \rightarrow 1^+} \frac{x+6}{x-1} = \boxed{\infty}$$

↑ getting $\frac{-21}{0}$

1 ← x

approaching 7
↑
approaching zero, pos.

$$5. \lim_{x \rightarrow \infty} \tan^{-1}\left(\frac{1}{x}\right) = \tan^{-1}\left(\lim_{x \rightarrow \infty} \frac{1}{x}\right) = \tan^{-1}(0) = \boxed{0}$$

$$1. \lim_{x \rightarrow 1} \frac{4x^2 - 4}{x^2 - 11x + 10} = \lim_{x \rightarrow 1} \frac{4(x^2 - 1)}{(x-1)(x-10)} = \lim_{x \rightarrow 1} \frac{4(x-1)(x+1)}{(x-1)(x-10)}$$

↑ getting $\frac{0}{0}$

$$= \lim_{x \rightarrow 1} \frac{4(x+1)}{x-10} = \frac{4(1+1)}{1-10} = \boxed{-\frac{8}{9}}$$

$$2. \lim_{x \rightarrow \infty} \frac{4x^2 - 4}{x^2 - 11x + 10} = \lim_{x \rightarrow \infty} \frac{4x^2 - 4}{x^2 - 11x + 10} \cdot \frac{\frac{1}{x^2}}{\frac{1}{x^2}} = \lim_{x \rightarrow \infty} \frac{4 - \frac{4}{x^2}}{1 - \frac{11}{x} + \frac{10}{x^2}}$$

$$= \frac{4 - 0}{1 - 0 + 0} = \boxed{4}$$

$$3. \lim_{x \rightarrow 0} \frac{4x^2 - 4}{x^2 - 11x + 10} = \frac{4 \cdot 0^2 - 4}{0^2 - 11 \cdot 0 + 10} = \frac{-4}{10} = \boxed{-\frac{2}{5}}$$

$$4. \lim_{x \rightarrow 10^+} \frac{4x^2 - 4}{x^2 - 11x + 10} = \lim_{x \rightarrow 10^+} \frac{4(x-1)(x+1)}{(x-1)(x-10)} = \lim_{x \rightarrow 10^+} \frac{4(x+1)}{x-10} = \boxed{\infty}$$

↑ getting $\frac{400-4}{0} = \frac{396}{0} \leftarrow \text{Expect } \pm \infty$

↑ approaches ∞

↑ approaching 0 and positive

$$5. \lim_{x \rightarrow 0^+} \tan^{-1}\left(\frac{1}{x}\right) = \boxed{\frac{\pi}{2}}$$

as x approaches 0 from the right $\frac{1}{x}$ approaches ∞ , so $\tan^{-1}\left(\frac{1}{x}\right)$ approaches $\frac{\pi}{2}$

$$1. \lim_{x \rightarrow 0} \frac{x^2 - 11x + 10}{4x^2 - 4} = \frac{0^2 - 11 \cdot 0 + 10}{4 \cdot 0^2 - 4} = \frac{10}{-4} = \boxed{\frac{5}{2}}$$

$$2. \lim_{x \rightarrow \infty} \frac{x^2 - 11x + 10}{4x^2 - 4} = \lim_{x \rightarrow \infty} \frac{x^2 - 11x + 10}{4x^2 - 4} \cdot \frac{\frac{1}{x^2}}{\frac{1}{x^2}} = \lim_{x \rightarrow \infty} \frac{1 - \frac{11}{x} + \frac{10}{x^2}}{4 - \frac{4}{x^2}}$$

$$= \frac{1 - 0 + 0}{4 - 0} = \boxed{\frac{1}{4}}$$

$$3. \lim_{x \rightarrow 1} \frac{x^2 - 11x + 10}{4x^2 - 4} = \lim_{x \rightarrow 1} \frac{(x-1)(x-10)}{4(x^2-1)} = \lim_{x \rightarrow 1} \frac{(x-1)(x-10)}{4(x-1)(x+1)}$$

getting $\frac{0}{0}$

$$= \lim_{x \rightarrow 1} \frac{x-10}{4(x+1)} = \frac{1-10}{4(1+1)} = \boxed{-\frac{9}{8}}$$

$$4. \lim_{x \rightarrow -1^+} \frac{x^2 - 11x + 10}{4x^2 - 4} = \lim_{x \rightarrow -1^+} \frac{x+10}{4(x+1)}$$

approaching 9

getting $\frac{22}{0}$

(factor and cancel as above)

approaching $4 \cdot 0 = 0$, pos

$$= \boxed{\infty}$$

$$5. \lim_{x \rightarrow \infty} e^{1/x} = \lim_{x \rightarrow \infty} e^{\frac{1}{x}} = e^{\lim_{x \rightarrow \infty} \frac{1}{x}} = e^0 = \boxed{1}$$

$$1. \lim_{x \rightarrow 4} \frac{x^2 - 5x + 4}{x^2 + 2x - 24} = \lim_{x \rightarrow 4} \frac{(x-4)(x-1)}{(x-4)(x+6)} = \lim_{x \rightarrow 4} \frac{x-1}{x+6} = \frac{4-1}{4+6} = \boxed{\frac{3}{10}}$$

getting $\frac{0}{0}$

$$2. \lim_{x \rightarrow \infty} \frac{x^2 - 5x + 4}{x^2 + 2x - 24} = \lim_{x \rightarrow \infty} \frac{x^2 - 5x + 4}{x^2} \cdot \frac{1}{\frac{x^2}{x^2} + \frac{2x}{x^2} - \frac{24}{x^2}} = \lim_{x \rightarrow \infty} \frac{1 - \frac{5}{x} + \frac{4}{x^2}}{1 + \frac{2}{x} - \frac{24}{x^2}} = \frac{1-0+0}{1+0-0} = \boxed{1}$$

$$3. \lim_{x \rightarrow 0} \frac{x^2 - 5x + 4}{x^2 + 2x - 24} = \frac{0^2 - 5 \cdot 0 + 4}{0^2 + 2 \cdot 0 - 24} = \frac{4}{-24} = \boxed{-\frac{1}{6}}$$

$$4. \lim_{x \rightarrow -6^+} \frac{x^2 - 5x + 4}{x^2 + 2x - 24} = \lim_{x \rightarrow -6^+} \frac{(x-4)(x-1)}{(x-4)(x+6)} = \lim_{x \rightarrow -6^+} \frac{x-1}{x+6} = \boxed{-\infty}$$

approaching -7

approaching 0 and positive

$$5. \lim_{x \rightarrow -\infty} e^x = \boxed{0}$$

