

## Task 1.2

$$1) \lim_{x \rightarrow 4} (x^2 - 4x + 1) = 16 - 16 + 1 = \underline{1}$$

$$2) \lim_{x \rightarrow 1} \frac{x+3}{x+6} = \underline{\frac{4}{7}}$$

$$3) \lim_{x \rightarrow 1} \frac{x^2 - 1}{x + 1} = \frac{0}{2} = \underline{0}$$

$$\begin{aligned} 4) \lim_{x \rightarrow 3} \frac{x^2 - 6x + 9}{x^2 - 9} &= \frac{9 - 18 + 9}{0} = \frac{0}{0} \\ &= \lim_{x \rightarrow 3} \frac{(x-3)(x-3)}{(x-3)(x+3)} \\ &= \lim_{x \rightarrow 3} \frac{x-3}{x+3} \\ &= \frac{0}{6} \\ &= \underline{0} \end{aligned}$$

$$5) \lim_{x \rightarrow 2} \frac{1}{4 - x^2} = \frac{1}{0} = \underline{\infty}$$

$$\begin{aligned} 6) \lim_{x \rightarrow 9} \frac{\sqrt{x} - 3}{x - 9} &= \frac{3 - 3}{9 - 9} = \frac{0}{0} \\ &= \lim_{x \rightarrow 9} \frac{\sqrt{x} - 3}{x - 9} \cdot \frac{\sqrt{x} + 3}{\sqrt{x} + 3} \\ &= \lim_{x \rightarrow 9} \frac{(x - 9)}{(x - 9)(\sqrt{x} + 3)} \\ &= \lim_{x \rightarrow 9} \frac{1}{\sqrt{x} + 3} \\ &= \underline{\frac{1}{6}} \end{aligned}$$

$$\lim_{x \rightarrow 9} \frac{\sqrt{x} - 3}{(\sqrt{x} - 3)(\sqrt{x} + 3)}$$

$$7/ \lim_{x \rightarrow 0} \frac{(x-\pi)^2}{\pi x} = \frac{0}{\pi \cdot 0} = 0$$

$$8/ \lim_{x \rightarrow 2} \frac{\sqrt{4-2(x+x^2)}}{x-2} = \frac{\sqrt{4-8+4}}{0} = \frac{0}{0}$$

$$= \lim_{x \rightarrow 2} \frac{\sqrt{(x-2)(x-2)}}{x-2} \quad (\sqrt{(x-2)^2})$$

$$= \lim_{x \rightarrow 2} \frac{x-2}{x-2}$$

$$= 1$$

$$9/ \lim_{x \rightarrow 2} \frac{(x-2)^2}{x^2-4} = \frac{0}{0}$$

$$= \lim_{x \rightarrow 2} \frac{(x-2)^2}{(x-2)(x+2)}$$

$$= \lim_{x \rightarrow 2} \frac{x-2}{x+2}$$

$$= \frac{0}{4}$$

$$= 0$$

$$10/ \lim_{x \rightarrow 3} \frac{x-3}{x^2-9} = \frac{0}{0}$$

$$= \lim_{x \rightarrow 3} \frac{x-3}{(x-3)(x+3)}$$

$$= \lim_{x \rightarrow 3} \frac{1}{x+3}$$

$$= \frac{1}{6}$$

$$11/ \lim_{x \rightarrow \frac{2\pi}{3}} \sin x = \sin \frac{2\pi}{3}$$

$$= \frac{\sqrt{3}}{2}$$

$$12/ \lim_{x \rightarrow \frac{5\pi}{4}} \cos x = \cos \frac{5\pi}{4}$$

$$= -\frac{\sqrt{2}}{2}$$

$$13/ \lim_{x \rightarrow 0} \frac{\sin 20x}{\sin 30x} = \frac{0}{0}$$

$$= \lim_{x \rightarrow 0} \frac{20x \cdot \sin 20x}{30x \cdot 20x} \cdot \frac{1}{\sin 30x} \rightarrow 1$$

$$= \frac{2}{3}$$

$$14/ \lim_{x \rightarrow 0^+} \frac{x - \sqrt{x}}{\sqrt{\sin x}} = \frac{0}{0}$$

$$= \lim_{x \rightarrow 0^+} \frac{x - \sqrt{x}}{\sqrt{x} \sqrt{\frac{\sin x}{x}}}$$

$$= \lim_{x \rightarrow 0^+} \frac{\sqrt{x} - 1}{\sqrt{\frac{\sin x}{x}}} \rightarrow 1$$

$$= \frac{-1}{1}$$

$$= -1$$

$$15/ \lim_{x \rightarrow 0^+} \frac{\sin \sqrt{1-x}}{\sqrt{1-x^2}} = \frac{\sin 1}{1} = \sin 1$$

$$\lim_{x \rightarrow 1^+} \frac{\sin \sqrt{1-x}}{\sqrt{1-x^2}} = \frac{0}{0}$$

$$= \lim_{1-x \rightarrow 0} \frac{\sin \sqrt{1-x}}{\sqrt{1-x}} \cdot \frac{1}{\sqrt{1+x}}$$

$$= \frac{1}{\sqrt{2}}$$

$$16/ \lim_{x \rightarrow 0} e^{x^2} = e^0 = 1$$

$$17/ \lim_{x \rightarrow 1} e^{x^2-1} = 1$$

$$18/ \lim_{x \rightarrow 1} \ln x = \ln 1 = 0$$

$$19/ \lim_{x \rightarrow 2} (e^x - \ln x) = e^2 - \ln 2$$

$$20/ \lim_{x \rightarrow 1} \frac{1}{\ln x} = \frac{1}{0} = \infty$$

$$\ln 0^+ = -\infty$$

$$\ln \infty = \infty$$