



$$\tan = \frac{\sin}{\cos}$$

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$$\text{الف) } \sin \frac{\pi}{6} + \cos \pi + 2 \tan \frac{3\pi}{4} = \frac{1}{2} + (-1) + 2(-1) = -\frac{3}{2}$$

$$\text{ب) } \cot \frac{\pi}{3} + 2 \cot \frac{5\pi}{3} - 2 \tan \frac{5\pi}{6} = \frac{1}{\sqrt{3}} + 2 \left(\frac{1}{\sqrt{3}} \right) - 2 \left(-\frac{1}{\sqrt{3}} \right) = \frac{4}{\sqrt{3}}$$

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$$\text{ج) } -\cos \frac{\pi}{6} + \sin \frac{\pi}{3} - 2 \sin \frac{4\pi}{3} = -\frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2} - 2 \left(-\frac{\sqrt{3}}{2} \right) = \sqrt{3}$$

$$\text{د) } \cos(\sin \pi) + \sin(\pi \cos \frac{\pi}{2}) = \cos(0) + \sin(0) = 1 + 0 = 1$$

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$$f(a) = \begin{cases} a^2 + 4a & x \geq a \\ 1 + a + 2 & x \leq a \end{cases} \rightarrow a^2 + 4a = 1 + a + 2 \Rightarrow a^2 + 3a - 3 = 0$$

$$\Delta = b^2 - 4ac = 9 + 12 = 21 \Rightarrow \sqrt{\Delta} = \sqrt{21} \approx 4.58 \rightarrow a = \frac{-3 \pm 4.58}{2} \Rightarrow a = \frac{1.58}{2} \approx 0.79 \rightarrow a = 1$$

$$f(x) = \begin{cases} x^2 + 4x & x \geq 1 \\ 1 + x + 2 & x < 1 \end{cases} \Rightarrow f(1) = 1 + 4(1) = 5$$

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$$|x+1| \geq 2 \Rightarrow -2 \leq x+1 \leq 2 \Rightarrow -3 \leq x \leq 1$$

$$f(-2) = \begin{cases} 2(-2)^2 - b = 11 - b \\ a + 2(-2) = a - 4 \end{cases} \Rightarrow 11 - b = a - 4 \Rightarrow a + b = 15$$

$$[2, 1] \cap (-\infty, -3] \cup [1, +\infty) = -3$$

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$$\text{الف) } y = \frac{1}{x^2 - 4x^2} \rightarrow D_f = \mathbb{R} - \{0, 2\}$$

$$\text{ب) } 2x^3 + 4x^2 + 2x + 4 \neq 0 \Rightarrow 2x^2(x+2) + 2(x+2) \neq 0 \Rightarrow (x+2)(2x^2+2) \neq 0 \Rightarrow x \neq -2$$

$$\rightarrow D_f = \mathbb{R} - \{-2\}$$

$\left. \begin{aligned} x^2 - 1 \geq 0 &\Rightarrow x^2 \geq 1 \Rightarrow 1 \leq x \leq -1 \\ x - 2 \geq 0 &\Rightarrow x \geq 2 \end{aligned} \right\} \Rightarrow x \geq 2 \rightarrow D_f = [2, +\infty)$	
$\begin{aligned} 4 - 3x \geq 0 &\Rightarrow 3x \leq 4 \Rightarrow x \leq \frac{4}{3} \\ 4x - 2 > 0 &\Rightarrow 4x > 2 \Rightarrow x > \frac{1}{2} \end{aligned} \Rightarrow \frac{1}{2} < x \leq \frac{4}{3} \rightarrow D_f = \left(\frac{1}{2}, \frac{4}{3}\right]$	6
$\left. \begin{aligned} 4x - a \geq 0 &\Rightarrow 4x \geq a \Rightarrow x \geq \frac{a}{4} \\ b - 3x \geq 0 &\Rightarrow b \geq 3x \Rightarrow x \leq \frac{b}{3} \end{aligned} \right\} \Rightarrow x = \left[\frac{b}{3}, \frac{a}{4}\right] = \emptyset \Rightarrow \frac{b}{3} = \frac{a}{4} \Rightarrow \frac{b}{a} = \frac{3}{4} = \frac{1}{\frac{4}{3}}$	7
الف) $x^5 - 13x^2 + 36 = 0 \xrightarrow{x=t} t^5 - 13t^2 + 36 = 0 \Rightarrow t = 9, 4 \Rightarrow x = -3, -2, 2, 3$ $y = \sqrt{\frac{x^5 - 13x^2 + 36}{x^5 - 13x^2 + 36}} \rightarrow \frac{-3}{+} \frac{-2}{-} \frac{2}{-} \frac{3}{+} \rightarrow D_f = (-\infty, -3) \cup (-2, 2) \cup (3, +\infty)$	8
$y = \sqrt{\frac{x^5 - 2x^2 - 2x + 6}{x^5 - 2x^2 - 2x - 6}} = \sqrt{\frac{(x-1)(x-2)(x+2)}{(x+1)(x+2)(x-2)}} \rightarrow \frac{-3}{+} \frac{-2}{-} \frac{-1}{-} \frac{1}{+} \frac{2}{-} \frac{2}{-} \rightarrow D_f = (-\infty, -3) \cup [-2, -1) \cup [1, 2) \cup [2, +\infty)$	
الف) $y = \sqrt{2[x] - 4} \rightarrow 2[x] - 4 \geq 0 \Rightarrow 2[x] \geq 4 \Rightarrow [x] \geq 2 \Rightarrow x \geq 2 \rightarrow D_f = [2, +\infty)$	
ب) $y = \sqrt{2[x] - 2} \rightarrow 2[x] - 2 \geq 0 \Rightarrow 2[x] \geq 2 \Rightarrow [x] \geq 1 \Rightarrow x \geq 1 \rightarrow D_f = [1, +\infty)$	9
الف) $y = \sqrt{\frac{x+1}{ x-2 }} + \sqrt{\frac{4-x}{x^2+2x+2}}$ ①, ②, ③ $\Rightarrow D_f = [-1, 6] - \{3\}$ ① $x-2 \neq 0 \Rightarrow x \neq 2$ ② $\frac{x+1}{ x-2 } \geq 0 \Rightarrow x+1 \geq 0 \Rightarrow x \geq -1$ ③ $\frac{4-x}{x^2+2x+2} \geq 0 \Rightarrow 4-x \geq 0 \Rightarrow x \leq 4$ ب) $[x] - 4 \geq 0 \Rightarrow [x] \geq 4 \Rightarrow x \geq 4 \Rightarrow D_f = [4, +\infty)$ ④ $2 - [x] \geq 0 \Rightarrow [x] \leq 2 \Rightarrow x < 3 \Rightarrow D_f = (-\infty, 3)$ ⑤ $[2, +\infty) \cap (-\infty, 3) = \emptyset \Rightarrow D_f = \emptyset$	10