(1) $\dfrac{-1}{x^2+2x+2}$ (2 a) $\frac{3}{8}x+\frac{1}{8}\sin 4x+\frac{1}{64}\sin 8x+C$ (2 b) $\dfrac{1}{2}\left(\dfrac{\pi^4}{81}-\dfrac{\pi^4}{256}\right)$ (2 c) $\frac{1}{2}x^2(\ln 5x)^2-\frac{1}{2}x^2\ln 5x+\frac{1}{4}x^2+C$

(2 d) $\frac{2}{5}(x-4)^{5/2}+\frac{16}{3}(x-4)^{3/2}+32(x-4)^{1/2}+C$ (2 e) $\frac{1}{21}\tan^7(3x)+\frac{1}{15}\tan^5(3x)+C$

(2 f) $2\ln|x+1|+\dfrac{3}{x+1}+2\ln|2x-1|+C$ (2 g) $-\dfrac{\pi}{48}+\dfrac{\sqrt{3}}{16}$ (2 h) $\dfrac{1}{2}\ln\left|\dfrac{2x}{3}+\dfrac{\sqrt{4x^2-9}}{3}\right|+C$

(3) e ; (4 a) $\dfrac{\pi}{15}$; (4 b) $\pi\displaystyle\int_0^1\left[x(x-1)^2\right]^2\,dx$; (5 a) 0 ; (5 b) e^2 ; (6 a) divergent ; (6 b) divergent

(7) $y=\ln|\sec x|$; (8 a) $S_n=\dfrac{3}{2}-\dfrac{3}{3n+2}$; (8 b) $\dfrac{3}{2}$

(9 a) divergent by DC ; (9 b) divergent by nTT ; (9 c) convergent by DC

(10 a) conditionally convergent by AST and DC ; (10 b) absolutely convergent by ratio test

(10 c) divergent by root test

(11) radius of convergence $=5$; interval of convergence $=(-9,\,1]$

(12 a) $f(x)=\ln(1+x)=x-\dfrac{x^2}{2}+\dfrac{x^3}{3}-\dfrac{x^4}{4}+\ldots$; (12 b) $\displaystyle\sum_{n=1}^{\infty}\frac{(-1)^{n+1}\,x^n}{n}$