1. (a) $\ln|x| + C$

(b) Use $u = x+1$, $du = dx$: $\int \frac{1}{1+x}\,dx = \int \frac{1}{u}\,du = \ln|u| + C = \ln|x+1| + C$

(c) Use $u = x+1$, $du = dx$: $\int u^{-2}\,du = -u^{-1} + C = -\frac{1}{x+1} + C$

(d) $\arctan(x) + C$

(e) Use $u = x^2+1$, $du = 2x\,dx$: $\int \frac{1}{x^2+1}\frac{1}{2}2x\,dx = \frac{1}{2}\int \frac{1}{u}\,du = \frac{1}{2}\ln|u| + C = \frac{1}{2}\ln|x^2+1| + C$

(f) $\int \frac{x^2+1}{x}\,dx = \int\left(\frac{x^2}{x} + \frac{1}{x}\right)dx = \int\left(x + \frac{1}{x}\right)dx = \frac{1}{2}x^2 + \ln|x| + C$

(g) Use $u = 1+x$, $du = dx$: $\int (1+x)^5\,dx = \int u^5\,du = \frac{1}{6}u^6 + C = \frac{1}{6}(1+x)^6 + C$

(h) Use $u = 1+x$, $du = dx$: $\int \frac{1}{(1+x)^5}\,dx = \int u^{-5}\,du = -\frac{1}{4}u^{-4} + C = -\frac{1}{4}(1+x)^{-4} + C = -\frac{1}{4(1+x)^4} + C$

(i) $\int (1+x^2)^2\,dx = \int (1 + 2x^2 + x^4)\,dx = x + \frac{2}{3}x^3 + \frac{1}{5}x^5 + C$

2. (a) $-\frac{3}{5}\cos(5t) + C$

(b) $\sin(\pi t) + C$

(c) Use $u = 3x+5$, $du = 3\,dx$: $\int \frac{1}{3}u^{1/2}\,du = \frac{1}{3}\cdot\frac{2}{3}\cdot u^{3/2} + C = \frac{2}{9}\cdot(3x+5)^{3/2} + C$

(d) $\int \pi \cdot e^{-x}\,dx = -\pi \cdot e^{-x} + C = -\frac{\pi}{e^x} + C$

(e) $-\frac{1}{3}e^{-3t} + C$

(f) $\int (e^t)^{1/2}\,dt = \int e^{\frac{1}{2}t}\,dt = 2e^{\frac{1}{2}t} + C = 2\sqrt{e^t} + C$

(g) $\int 6t^{-3/2}\,dt = -2\cdot 6t^{-1/2} + C = -\frac{12}{\sqrt{t}} + C$

(h) Use $u = 3t+8$, $du = 3dt$: $\int \frac{1}{3t+8}\,dt = \int \frac{1}{u}\cdot\frac{1}{3}\,du = \frac{1}{3}\ln|u| + C = \frac{1}{3}\ln|3t+8| + C$

3. In all parts of this problem use $u = 2x+1, du = 2dx$.

(a) $\int u^3\,\frac{1}{2}\,du = \frac{1}{2}\cdot\frac{1}{4}u^4 + C = \frac{1}{8}(2x+1)^4 + C$

(b) $\int u^{-2}\,\frac{1}{2}\,du = -\frac{1}{2}u^{-1} + C = -\frac{1}{2(2x+1)} + C$

(c) $\int \frac{1}{u}\cdot\frac{1}{2}\,du = \frac{1}{2}\ln|u| + C = \frac{1}{2}\ln|2x+1| + C$

(d) $\int u^{-\frac{1}{2}}\cdot\frac{1}{2}\,du = u^{\frac{1}{2}} + C = \sqrt{2x+1} + C$