Write out the form of the partial fraction decomposition of the function. Do not determine the numerical values of the coefficients.

1) $\dfrac{2x}{(x+3)(3x+1)}$ $\boxed{\dfrac{A}{(x+3)}+\dfrac{B}{(3x+1)}}$

2) $\dfrac{1}{x^3+2x^2+x}$ $\boxed{\dfrac{A}{x}+\dfrac{B}{x+1}+\dfrac{C}{(x+1)^2}}$

3) $\dfrac{2}{x^2+3x-4}$ $\boxed{\dfrac{A}{x+4}+\dfrac{B}{x-1}}$

4) $\dfrac{x^2}{(x-1)(x^2+x+1)}$ $\boxed{\dfrac{A}{x-1}+\dfrac{Bx+C}{x^2+x+1}}$

5) $\dfrac{x^3}{x^2+4x+3}$ $\boxed{x-4+\dfrac{A}{x+1}+\dfrac{B}{x+3}}$

6) $\dfrac{2x+1}{(x+1)^3(x^2+4)^2}$ $\boxed{\dfrac{A}{x+1}+\dfrac{B}{(x+1)^2}+\dfrac{C}{(x+1)^3}+\dfrac{Dx+E}{x^2+4}+\dfrac{Fx+G}{(x^2+4)^2}}$

7) $\dfrac{x^4}{x^4-1}$ $\boxed{1+\dfrac{A}{x-1}+\dfrac{B}{x+1}+\dfrac{Cx+D}{x^2+1}}$

8) $\dfrac{t^4+t^2+1}{(t^2+1)(t^2+4)^2}$ $\boxed{\dfrac{At+B}{t^2+1}+\dfrac{Ct+D}{t^2+4}+\dfrac{Et+F}{(t^2+4)^2}}$

Evaluate the integral

9) $\int \dfrac{x}{x-6}dx$ $\boxed{x+6\ln|x-6|+C}$

10) $\int \dfrac{r^2}{r+4}dr$ $\boxed{\dfrac{1}{2}r^2-4r+16\ln|r+4|+C}$

11) $\int \dfrac{x-9}{(x+5)(x-2)}dx$ $\boxed{2\ln|x+5|-\ln|x-2|+C}$

12) $\int_2^3 \dfrac{1}{x^2-1}dx$ $\boxed{\dfrac{1}{2}\ln\left(\dfrac{3}{2}\right)}$

13) $\int_0^1 \dfrac{2x+3}{(x+1)^2}\,dx$ $\qquad$ $\boxed{2\ln 2 + \dfrac{1}{2}}$

14) $\int_0^1 \dfrac{x^3-4x-10}{x^2-x-6}\,dx$ $\quad$ $\boxed{\dfrac{3}{2} + \ln\left(\dfrac{3}{2}\right)}$

15) $\int \dfrac{x^2}{(x+1)^3}\,dx$ $\qquad$ $\boxed{\ln|x+1| + \dfrac{2}{x+1} - \dfrac{1}{2(x+1)^2} + C}$

16) $\int \dfrac{x^4+1}{x(x^2+1)^2}\,dx$ $\quad$ $\boxed{\ln|x| + \dfrac{1}{x^2+1} + C}$

Make a substitution to express the integrand as a rational function and then evaluate the integral.

17) $\int \dfrac{1}{\sqrt{x} - \sqrt[3]{x}}\, dx$ [Hint: substitute $u = \sqrt[6]{x}$] $\boxed{2\sqrt{x} + 3\sqrt[3]{x} + 6\sqrt[6]{x} + 6\ln\left|\sqrt[6]{x} - 1\right| + C}$

18) $\int \dfrac{e^{2x}}{e^{2x} + 3e^x + 2}\, dx$ $\boxed{\ln\left[\dfrac{(e^x + 2)^2}{e^x + 1}\right] + C}$