Integration multiple procedures

Compute the following integrals:

1. $\int \frac{8dx}{x^3-4x}$; $\int \frac{5x^2-9}{x^3-9x}dx$; $\int \frac{x+2}{x^4+2x^3+x^2}$; $\int \frac{6x^2+3x+4}{x^3+2x}dx$;

2. $\int \frac{4x^3+3x^2+18x+12}{(x^2+4)^2}dx$; $\int_0^{\pi/4} e^x(\sqrt{3}\cos 2x-\sin 2x)dx$; $\int_0^1 (x^2e^x+\frac{x^2}{2}-\ln(1+x))dx$;

3. $\int \frac{5x^2+12x+9}{x^3+3x^2+3x}dx$; $\int \frac{5x+9}{(x-9)x^{3/2}}dx$; $\int \frac{\sqrt{x}}{x^3+2x^2-3x}dx$; $\int \frac{dx}{x-x^{4/3}}$;

4. $\int_0^3 \frac{dx}{(x+2)\sqrt{x+1}}$; $\int_0^{1/2} \frac{dt}{\sqrt{2t}(9+\sqrt[3]{2t})}$; $\int_3^{29} \frac{(t-2)^{2/3}}{(t-2)^{2/3}+3}dt$; $\int x^5\sqrt{1+x^3}dx$;

5. $\int \frac{x^5}{(2+3x^3)^{3/2}}dx$; $\int \frac{dx}{x^3(1+x^3)^{1/3}}$; $\int \frac{dx}{1+\sin x+\cos x}$; $\int \frac{dx}{\sin x+tgx}$;

6. $\int \frac{dx}{5+4\cos x}$; $\int \frac{dx}{1+\sin x-\cos x}$; $\int_0^{\pi} \frac{dx}{5-3\cos x}$; $\int_0^{\pi/2} \frac{dx}{2+\cos x}$;

7. $\int_0^{\pi/2} \frac{dx}{2+\sin x}$; $\int_0^{\pi/6} \frac{1+tgx}{1+\sin 2x}dx$; $\int_0^1 \frac{x-2}{(2x-3)^2}dx$; $\int_0^1 \frac{e^x-1}{e^x+1}dx$;

8. Verify the following:

$\int_0^1 \frac{dx}{e^x+e^{-x}} = \text{arctg}\, e-\frac{\pi}{4}$, (hint : $e^x=z$); $\int_0^a \frac{dx}{\sqrt{ax-x^2}}$, (hint : $x=a\sin^2 z$)

$\int_0^1 \sqrt{2t+t^2}dt=\sqrt{3}-\frac{1}{2}\ln(2+\sqrt{3})$, (hint : t+1=z); $\int_{1/3}^1 \frac{(x-x^3)^{1/3}}{x^4}=6$, (hint : $x=\frac{1}{z}$)

$\int_0^1 \frac{x^3}{(1+x^2)^{3/2}}dx$; Deduce the limit value of the following sum $S_n=\frac{1}{n^4}\sum_{k=1}^{k=n}\frac{k^3}{\sqrt{\left(1+\frac{k^2}{n^2}\right)^3}}$