Partial Fractions, Integration and Binomial Expansions

Write these as partial fractions…

$$\frac{3x^2+1}{x^2-1} \qquad \frac{x^2+7x+10}{x^2+5x+6} \qquad \frac{6x^2}{3x-1} \qquad \frac{6x^3+1}{x^2+2}$$

Integrate these…

$$\int \frac{3x^2+4}{x^2+4x}\,dx \qquad \int \frac{6x^2}{4x^2-9}\,dx \qquad \int \frac{6x^2+1}{(3x+1)(x+2)}\,dx \qquad \int \frac{5x^3}{x^2-1}\,dx$$

Write these as binomial expansions in increasing powers of x, up to and including the x^2 term…

$$\frac{x^2+3}{x^2-1} \qquad \frac{6x^2+1}{(2x+3)(x+2)} \qquad \frac{6x^2}{2x-3}$$