Integrals

Moderate

Polynomial Fractions

1. $\int \dfrac{\left(x^3 + 9\right)}{x^2 + 3x + 2} dx$

2. $\int \dfrac{x^3}{x^2 + x - 2} dx$

3. $\int \dfrac{x^4}{x^2 + x - 2} dx$

4. $\int \dfrac{x^3}{x^2 - 5x + 6} dx$

5. $\int \dfrac{x^3 - 4x - 10}{x^2 - x - 6} dx$

6. $\int \dfrac{\left(x^3 - 21x\right)}{\left(5 + 4x - x^2\right)} dx$

7. $\int \dfrac{x^4 - 8x^2 - 10}{x^2 - 3x - 10} dx$

8. $\int \dfrac{x^4 - x^2 + 2}{x^2 (x - 1)} dx$

9. $\int \dfrac{2x^3 - 2x^2 + 1}{x^2 - x} dx$

10. $\int \dfrac{x^4 - 2x^2 + 4x + 1}{x^3 - x^2 - x + 1} dx$

Answers

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1. $\dfrac{x^2}{2} - 3x + 8\ln\left|x + 1\right| - \ln\left|x + 2\right| + C$

2. $\dfrac{x^2}{2} - x + \dfrac{1}{3}\ln\left|x - 1\right| + \dfrac{8}{3}\ln\left|x + 2\right| + C$

3. $\dfrac{x^3}{3} - \dfrac{x^2}{2} + 3x + \dfrac{1}{3}\ln\left|x - 1\right| - \dfrac{16}{3}\ln\left|x + 2\right| + C$

4. $\dfrac{x^2}{2} + 5x - 8\ln\left|x - 2\right| + 27\ln\left|x - 3\right| + C$

5. $\dfrac{x^2}{2} + x + 2\ln\left|x + 2\right| + \ln\left|x - 3\right| + C$

6. $-\dfrac{x^2}{2} - 4x + 20\left(\dfrac{1}{6}\ln\left|x + 1\right| - \dfrac{1}{6}\ln\left|x - 5\right|\right) + C$

7. $\dfrac{x^3}{3} + \dfrac{3x^2}{2} + 11x + \dfrac{26}{7}\ln\left|x + 2\right| + \dfrac{415}{7}\ln\left|x - 5\right| + C$

8. $\dfrac{x^2}{2} + x - 2\ln\left|x\right| + \dfrac{2}{x} + 2\ln\left|x - 1\right| + C$

9. $x^2 - \ln\left|x\right| + \ln\left|x - 1\right| + C$

10. $\dfrac{x^2}{2} + x + \ln\left|x - 1\right| - \dfrac{2}{x - 1} - \ln\left|x + 1\right| + C$