

WARM UP

1. $\int x e^{1+x^2} dx$

2. If $F(x) = \int_1^{x^2} \sqrt{1+t^3} dt$, then $F'(x) =$

(A) $2x\sqrt{1+x^6}$ (B) $2x\sqrt{1+x^3}$

(C) $\sqrt{1+x^6}$

(D) $\sqrt{1+x^3}$ (E) $\int_1^{x^2} \frac{3t^2}{2\sqrt{1+t^3}} dt$

Integrating Partial Fractions

Objectives:

- Integrate using partial fraction decomposition.
- Integrate using long division.

Partial Fractions Decomposition

The process of breaking down a rational expression (fraction) into the sum of rational functions with distinct linear denominators.

Degree of denominator $>$ Degree of numerator

(bottom heavy)

Example 1: $\int \frac{x+5}{x^2+x-2} dx$

Example 2: $\int \frac{x-13}{2x^2-7x+3} dx$

If the degree of the numerator is larger or equal to, we must do long division and then integrate.

Example 3: $\int \frac{3x^4+1}{x^2-1} dx$

Example 4: $\int \frac{(x^3 + 1) dx}{x^2 + 1}$