I: Integrate. $\int x^n \, dx = \frac{x^{n+1}}{n+1} + C$

1) $\int 6 \, dx$

2) $\int 3t^2 \, dt$

3) $\int 5x^{-3} \, dx$

4) $\int du$

5) $\int x^{3/2} \, dx$

6) $\int (x^3 + 2) dx$

7) $\int 2x^{-2} \, dx$

8) $\int \frac{x^2+2}{x^2} \, dx$

9) $\int x(3x^2 + 1) dx$

10) $\int (x-1)(6x - 5) dx$

11) $\int \left(\frac{x^3+2x^2-4x}{x} \right) dx$

12) $\int \left(\frac{1}{x^3} - \frac{2}{x^2} \right) dx$

13) $\int (2x^2 - 1)(x - 3) dx$

14) $\int u(5u^{-2} + 1) du$

15) $\int \frac{(t-4)(t+4)}{t^2} \, dt$

II- Integrate or Find the indefinite integral. $\int u'u^n \, dx = \frac{u^{n+1}}{n+1} + C$

1) $\int 2x(x^2 - 1)^3 dx$

2) $\int x(1 - 2x^2)^3 dx$

3) $\int (1 + 4x)(2x^2 + x + 1)^3 dx$

4) $\int (x - 1)^4 dx$

5) $\int (3x - 1)^5 dx$

6) $\int (x^3 + 3x)(x^2 + 1) dx$

III- Integrate or Find the indefinite integral $\int u'u^n \, dx = \frac{u^{n+1}}{n+1} + C$

1) $\int \frac{1}{(x+4)^2} \, dx$

2) $\int \frac{2x}{(x^2+4)^3} \, dx$

3) $\int \frac{2x+3}{(x^2+3x+7)^3} \, dx$

4) $\int \frac{x^2}{(x^3-1)^2} \, dx$

5) $\int \frac{6x}{(x^2+1)^2} \, dx$

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

IV- Find the function F(x) :   (condition to determine C)

1) $f(x) = 6x(x - 1)$ and $F(1) = -1$

2) $f(x) = \frac{2-x}{x^3}$ and $F(2) = \frac{3}{4}$

3) $f(x) = -5x + 2$ and $F(0) = 2$

V- Integrate or Find the indefinite integral $\int u'e^u \, dx = e^u + C$

1) $\int 2e^{2x} \, dx$

2) $\int 5e^{-x} \, dx$

3) $\int e^{4x} \, dx$

4) $\int 2xe^{x^2} \, dx$

5) $\int 2e^{x+2} \, dx$

6) $\int 2e^{2-x} \, dx$

7) $\int -3e^{-3x} \, dx$

8) $\int (x + 1)e^{x^2+2x} \, dx$

VI- Integrate or Find the indefinite integral

1) $\int \frac{e^{2x}+2e^x+1}{e^x} \, dx$

2) $\int (e^x - e^{-x})^2 \, dx$

3) $\int \frac{2(e^x-e^{-x})}{(e^x+e^{-x})^2} \, dx$

VII- Integrate or Find the indefinite integral $\int \frac{u'}{u} dx = \ln|u| + C$

1) $\int \frac{1}{x+4} \, dx$

2) $\int \frac{1}{3-2x} \, dx$

3) $\int \frac{x}{x^2+4} \, dx$

4) $\int \frac{2x+3}{x^2+3x+7} \, dx$

5) $\int \frac{e^{-x}}{1+e^{-x}} \, dx$

6) $\int \frac{e^{2x}}{1+e^{2x}} \, dx$

7) $\int \frac{3e^x}{1+e^x} \, dx$

8) $\int \frac{lnx}{x} \, dx$

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1) $\int_0^2 3dx$ 2) $\int_2^5 3xdx$

3) $\int_0^1 (x - x^2)dx$ 4) $\int_{-1}^1 (1 - x^4)dx$

5) $\int_1^4 \frac{x^2+4}{x}dx$ 6) $\int_0^3 (3x^2 + x - 2)dx$

7) $\int_1^2 e^{-x}dx$ 8) $\int_2^3 \frac{x+1}{x^2+2x-3}dx$

9) $\int_0^1 (2x)dx$ 10) $\int_{-1}^0 (2x + 1)dx$

11) $\int_{-1}^1 x^2 dx$ 12) $\int_0^1 (2x - 1)^2 dx$

13) $\int_0^1 e^{-2x}dx$ 14) $\int_1^3 (2x - 1)dx$

15) $\int_3^4 (x^2 - 9)dx$ 16) $\int_0^1 (x - x^3)dx$

17) $\int_0^1 x^2(x^3 + 1)dx$ 18) $\int_0^4 \frac{e^x}{1+e^x}dx$

19) $\int_{-5}^5 xdx$ 20) $\int_0^4 (x - 5)dx$

21) $\int_{-1}^1 (x - x^2)dx$ 22) $\int_0^1 (1 - x^3)dx$

23) $\int_0^4 \frac{e^x}{(1+e^x)^2}dx$ 24) $\int_1^2 (2x + 1)(x^2 + x)^3 dx$

IX- Calculate the following integrals :

  1)- Calculate a , b and c so that $F(x) = (ax^2 + bx + c)e^x$ is a primitive to the function $f(x) = 15xe^x$

  2) Let $h(x) = \int_2^x (3t^2 - 4t + 2)dt$, find h(x) then deduce its derivative h'(x).

X- Calculate the following integrals (by parts)

  1) $\int x^2 e^x dx$ 2) $\int lnxdx$ 3) $\int (x + 1)e^x dx$ 4) $\int \frac{lnx}{x^2}dx$

  5)

         a) $\int_0^2 xe^x dx$ b) $\int_1^e lnxdx$ c) $\int_1^2 xlnxdx$

         d) $\int_0^2 x^2 e^x dx$ e) $\int_0^2 (x - 2)e^x dx$ f) $\int_1^2 x^2 lnxdx$
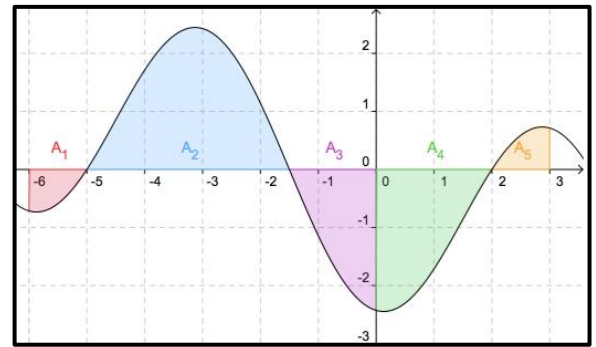
Part A :   Consider the following areas between the curve

and the (x'x) Knowing the values of A_1; A_2; A_3; A_4 and A_5

1) Use the previous areas to express each integral :

$I_1 = \int_{-6}^{-5} f(x)dx$ $I_2 = \int_{-5}^{-1.5} f(x)dx$

$I_3 = \int_{-1.5}^{0} f(x)dx$ $I_4 = \int_{0}^{2} f(x)dx$

$I_6 = \int_{2}^{3} f(x)dx$

2) Use I_1 ; I_2 and I_3 to express the sum : $A_1 + A_2 + A_3 + A_4 + A_5$

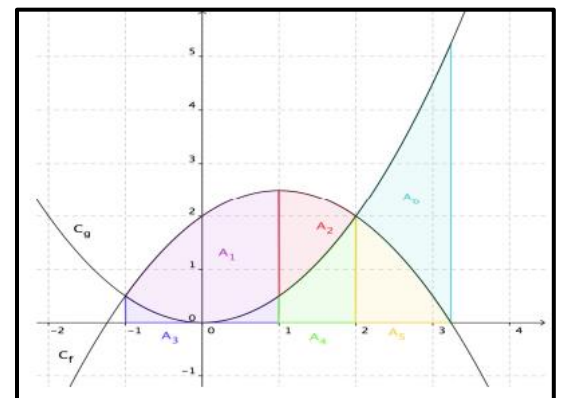**Part B** : Consider the two functions g and f and their curves

Knowing that values of the areas A_1; A_2; A_3; A_4 ; A_5 and A_6

1) Express the following integrals in terms of the previous areas :

$I_1 = \int_{-}^{-1} f(x)dx$; $I_2 = \int_{-1}^{3} g(x)dx$

$I_3 = \int_{-1}^{3}[f(x) - g(x)]dx$

$I_4 = \int_{-1}^{2}|f(x) - g(x)|dx$

2) Express ,using the integrals ,the sum : $A_4 + A_5$

Part C : Consider the following curve of the function f defined over $\mathbb{R}$

By $f(x) = \frac{1}{3}x^2 - x$

a) Express the green area in terms of integral then calculate its value

b) Same to the blue area

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