5-26 Determine a primitiva mais geral da função. (Confira sua resposta derivando-a.)

$$\boxed{\int c\,dx = cx.}$$

$$\boxed{\int cf(x)\,dx = cF(x).}$$

$$\boxed{\int f(x) + g(x)\,dx = F(x) + G(x).}$$

$$\boxed{\int x^n\,dx = \tfrac{x^{n+1}}{n+1} \quad (\text{for } n \neq -1).}$$

Problem 15.

$$f(t) = \frac{2t - 4 + 3\sqrt{t}}{\sqrt{t}}$$

Ans.

$$\begin{aligned} f(t) &= 2t - 4 + 3 \times t^{\frac{1}{2}} \\ F(t) &= 2 \times \frac{t^2}{2} - 4t + 3 \times \frac{t^{\frac{1}{2}+1}}{\frac{1}{2}+1} \\ &= t^2 - 4t + 3 \times \frac{t^{\frac{3}{2}}}{3/2} \\ &= t^2 - 4t + 3 \times 2 \times \frac{t^{3/2}}{3} \\ &= t^2 - 4t + 2t^{\frac{3}{2}} + C \end{aligned} \tag{1}$$

□

Problem 16.

$$f(x) = \sqrt[4]{5} + \sqrt[4]{x}$$

Ans.

$$\begin{aligned} f(x) &= 5^{\frac{1}{4}} + x^{\frac{1}{4}} \\ F(x) &= 5x^{\frac{1}{4}+1} + \frac{x^{\frac{1}{4}+1}}{\frac{1}{4}+1} \\ &= 5x^{\frac{1}{4}} + \frac{x^{\frac{5}{4}}}{5/4} \\ &= 5x^{\frac{1}{4}} + \frac{4x^{\frac{5}{4}}}{5} + C \end{aligned} \tag{2}$$

□

$\boxed{\int \frac{1}{x}\,dx = \ln|x|.}$

Problem 17.

$$f(x) = \frac{2}{5x} - \frac{3}{x^2}$$

Ans.

$$\begin{aligned} f(x) &= \frac{2}{5} \times \frac{1}{x} + 3x^{-2} \\ F(x) &= \frac{2}{5}x \times ln|x| + 3 \times x^{-2+1} \\ &= \frac{2}{5}ln|x| + \frac{3}{x} \end{aligned} \tag{3}$$

□

Problem 18.

$$f(x) = \frac{5x^2 - 6x + 4}{x^2}, \quad x > 0$$

Ans.

$$\begin{aligned} f(x) &= (5x^2 - 6x + 4) \times x^{-2} \\ &= 5x^2 \times x^{-2} - 6x \times x^{-2} + 4 \times x^{-2} \\ &= 5 - 6x^{-1} + 4x^{-2} \\ &= 5 - 6 \times \frac{1}{x} + 4x^{-2} \\ F(x) &= 5x - 6\ln|x| + 4 \times \frac{x^{-2+1}}{-2+1} \\ &= 5x - 6\ln|x| - \frac{4}{x} + C \end{aligned} \tag{4}$$

□

$\boxed{\int e^x\,dx = e^x.}$

Problem 19.

$$g(t) = 7e^t - e^3$$

Ans.

$$G(t) = 7e^t - et^3 + C \tag{5}$$

□

Problem 20.

$$f(x) = \frac{10}{x^6} - 2e^x + 3$$

Ans.

$$\begin{aligned} f(x) &= 10x^{-6} - 2e^x + 3 \\ F(x) &= 10 \times \frac{x^{-6+1}}{-6+1} - 2e^x + 3x \\ &= -\frac{2}{x^5} - 2e^x + 3x + C \end{aligned} \tag{6}$$

□

$\boxed{\int \cos x \, dx = \sin x.}$

$\boxed{\int \sin x \, dx = -\cos x.}$

$\boxed{\int \sec^2 x \, dx = \tan x.}$

$\boxed{\int \sec x \tan x \, dx = \sec x.}$

Problem 21.

$$f(\theta) = 2\sin\theta - 3\sec\theta\tan\theta$$

Ans.

$$F(\theta) = -2\sin\theta - 3\sec\theta + C \tag{7}$$

□

Problem 22.

$$h(x) = \sec^2 x + \pi\cos x$$

Ans.

$$H(x) = \tan x + \pi\sin x + C \tag{8}$$

□

$\boxed{\int \frac{1}{\sqrt{1-x^2}} \, dx = \sin^{-1}x.}$

$\boxed{\int \frac{1}{1+x^2} \, dx = \tan^{-1}x.}$

Problem 23.

$$f(r) = \frac{4}{1+r^2} - \sqrt[5]{r^4}$$

Ans.

$$\begin{aligned} f(r) &= 4 \times \frac{1}{1+r^2} - r^{4/5} \\ F(r) &= 4\tan^{-1} r - \frac{r^{4/5+1}}{4/5+1} \\ &= 4\tan^{-1} r - \frac{r^{9/5}}{9/5} \\ &= 4\tan^{-1} r - \frac{5}{9}\sqrt[5]{r^9} + C \end{aligned} \tag{9}$$

□

Problem 24.

$$g(v) = 2\cos v - \frac{3}{\sqrt{1-v^2}}$$

Ans.

$$\begin{aligned} g(v) &= 2\cos v - 3 \times \frac{1}{\sqrt{1-v^2}} \\ G(v) &= 2\sin v - 3\sin^{-1} v + C \end{aligned} \tag{10}$$

□

$\int b^x \, dx = \frac{b^x}{\ln b}$.

$\int \cosh x \, dx = \sinh x$.

$\int \sinh x \, dx = \cosh x$.

Problem 25.

$$f(x) = 2^x + 4\sinh x$$

Ans.

$$F(x) = \frac{2^x}{\ln b} + 4\cosh x + C \tag{11}$$

□

$\int \frac{1}{1-x^2} \, dx = \tanh^{-1} x$.

$\int \frac{1}{1-x^2} \, dx = \frac{1}{2}\ln\left\lvert\frac{x+1}{x-1}\right\rvert$.

$\ln a - \ln b = \ln(\frac{a}{b})$.

Problem 26.

$$f(x) = \frac{2x^2 + 5}{x^2 - 1}$$

Ans.

$$\begin{aligned}
f(x) &= \frac{2(x^2-1)+7}{x^2-1} \\
&= 2 + \frac{7}{x^2-1} \\
\frac{7}{x^2+1} &= \frac{A}{x-1} + \frac{B}{x+1} \\
7 &= \frac{A(x+1)(x-1)}{(x-1)} + \frac{A(x+1)(x-1)}{(x+1)} \\
7 &= A(x+1) + B(x-1) \\
7 &= Ax + A + Bx - B \\
7 &= (A+B)x + (A-B) \\
7 &= (0)x + (A-B) \\
7 &= (A-B) \\
B &= -A \\
7 &= A - (-A) \\
7 &= A + A \\
A &= \frac{7}{2} \;\&\; B = -\frac{7}{2} \\
\frac{7}{x^2+1} &= \frac{7/2}{x-1} - \frac{7/2}{x+1} \\
&= 2 + \frac{7}{2} \times \frac{1}{x-1} - \frac{7}{2} \times \frac{1}{x+1} \\
F(x) &= 2x + \frac{7}{2}\ln|x-1| - \frac{7}{2}\ln|x+1| \\
&= 2x + \frac{7}{2}\left|\frac{\ln x - 1}{\ln x + 1}\right| + C
\end{aligned} \tag{12}$$

□

27-28 Determine a função F que seja primitiva de f e satisfaça a condição indicada. Confira sua resposta comparando os gráficos de f e F.

Problem 28.

$$f(x) = 4 - 3(1+x^2)^{-1}, \quad F(1) = 0$$

Ans.

$$
\begin{aligned}
f(x) &= 4 - 3 \times \frac{1}{1+x^2} \\
F(x) &= 4x - 3\tan^{-1}x + C \\
F(0) &= 4 \times 0 - 3\tan^{-1}0 + C \\
1 &= 0 - 0 + C \\
C &= 1 \\
F(x) &= 4x - 3\tan^{-1}x + 1
\end{aligned} \tag{13}
$$

□

29-54 Determine f.

Problem 35.

$$f'''(t) = 12 + \sin t$$

Ans.

$$F(t) = ? \tag{14}$$

□

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