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Chapter 13 Problem Solving Set A

Bronze:

a) $f'(x) = \frac{-5x^2}{\sqrt{x}} + \frac{7x^{2/3}}{\sqrt{x}} \rightarrow -5x^2(x^{-1/2}) + 7x^{2/3}(x^{-1/2})$

$\hookrightarrow -5x^{3/2} + 7x^{1/6}$

b) $\int -5x^{3/2} + 7x^{1/6} \, dx \rightarrow \frac{-5x^{5/2}}{5/2} + \frac{7x^{7/6}}{7/6} + c$

$\hookrightarrow -2x^{5/2} + 6x^{7/6} + c$

$-2x^{5/2} + 6x^{7/6} + c$

$\hookrightarrow$ sub $x = 1$

$-2(1)^{5/2} + 6(1)^{7/6} + c = -10$

$4 + c = -10$

$c = -10 - 4$

$c = -14$

$\therefore$ equation: $-2x^{5/2} + 6x^{7/6} - 14$

Silver:

$f'(x) = (1 - 2x^{1/3})^3$

$\hookrightarrow 1^3 + \binom{3}{1}(1)^2(-2x^{1/3}) + \binom{3}{2}(1)(-2x^{1/3})^2 + (-2x^{1/3})^3$

$\hookrightarrow 1 - 6x^{1/3} + 12x^{2/3} - 8x$

$\int 1 - 6x^{1/3} + 12x^{2/3} - 8x \, dx \rightarrow x - \frac{6x^{4/3}}{4/3} + \frac{12x^{5/3}}{5/3} - \frac{8x^2}{2} + c$

$\hookrightarrow x - 9/_2 x^{4/3} + 36/_5 x^{5/3} - 4x^2 + c$

$x - 9/_2 x^{4/3} + 36/_5 x^{5/3} - 4x^2 + c$

$\hookrightarrow$ sub $x = 8$

$8 - 9/_2 (8)^{4/3} + 36/_5 (8)^{5/3} - 4(8)^2 + c = 24$

$-\frac{448}{5} + c = 24$

$c = 24 + \frac{448}{5}$

$c = \frac{568}{5}$

$f(1) = 1 - 9/_2 (1)^{4/3} + 36/_5 (1)^{5/3} - 4(1)^2 + 568/_5$

$= 1133/_{10} = 113.3$

Gold:

$f'(x) = 3x^2 + px + 8x^{-2}$

$\int 3x^2 + px + 8x^{-2}\,dx \rightarrow \frac{3x^3}{3} + \frac{px^2}{2} + \frac{8x^{-1}}{-1} + c$

$\hookrightarrow x^3 + p/_2\, x^2 - 8x^{-1} + c$

sub $x = -4$

$(-4)^3 + p/_2(-4)^2 - 8(-4)^{-1} + c = -85$

$64 + 8p + 2 + c = -85$

$\underline{8p + c = -23}$

sub $x = 2$

$(2)^3 + p/_2(2)^2 - 8(2)^{-1} + c = 11$

$8 + 2p - 4 + c = 11$

$\underline{2p + c = 7}$

$$\begin{aligned} - \quad 8p + c &= -23 \\ 2p + c &= 7 \\ \hline 6p &= -30 \\ p &= -5 \end{aligned}$$

when $p = -5$

$2(-5) + c = 7$

$-10 + c = 7$

$c = 7 + 10$

$c = 17$

Full equation: $\underline{x^3 - 5/_2\, x^2 - 8x^{-1} + 17}$