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Instructions: *Include all relevant work to get full credit. Write your solutions using proper notations. Encircle your final answers.*

Quiz #15

1. Find the general antiderivative of the following functions:

a. $f(x) = 8x^3 - x + 3$ [2]

$$\Rightarrow F(x) = \int (8x^3 - x + 3)\,dx = \frac{8x^4}{4} - \frac{x^2}{2} + 3x + C$$

$$= 2x^4 - \frac{1}{2}x^2 + 3x + C$$

b. $f(\theta) = \sec^2(\theta) - \sec(\theta)\tan(\theta)$ [2]

$$\Rightarrow F(\theta) = \int (\sec^2\theta - \sec\theta\tan\theta)\,d\theta$$

$$= \int \sec^2\theta\,d\theta - \int \sec\theta\tan\theta\,d\theta$$

$$= \tan\theta - \sec\theta + C$$

c. $f(t) = t^2(7\sqrt{t} - \frac{2}{t^3})$ [2]

$$\Rightarrow F(t) = \int t^2\left(7\sqrt{t} - \frac{2}{t^3}\right)dt = \int t^2\left(7t^{1/2} - 2t^{-3}\right)dt$$

$$= 7\int t^{5/2}\,dt - 2\int \frac{1}{t}\,dt$$

$$= 7 \cdot \frac{t^{7/2}}{7/2} - 2\ln|t| + C$$

$$= 2t^{7/2} - 2\ln|t| + C$$

2. Find $f(x)$ if $f'(x) = \dfrac{x+1}{\sqrt{x}}$ and $f(1) = 5$. [4]

$$\Rightarrow f(x) = \int \frac{x+1}{\sqrt{x}}\,dx = \int (x^{1/2} + x^{-1/2})\,dx$$

$$= \frac{x^{3/2}}{3/2} + \frac{x^{1/2}}{1/2} + C$$

$$\Rightarrow f(1) = \frac{2}{3}(1)^{3/2} + 2(1)^{1/2} + C = 5 \Rightarrow \frac{2}{3} + 2 + C = 5$$

$$\Rightarrow C = 3 - 2/3 = 7/3$$

$$\therefore f(x) = \frac{2}{3}x^{3/2} + 2\sqrt{x} + 7/3$$