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 MAC 2312.0703
 Cyr

Quiz 2

You must show all work to receive full credit!!

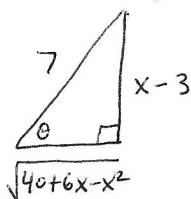
Problem 1. (3 pts) Evaluate $\int \sqrt{40+6x-x^2} dx$.

$$-(x^2-6x-40) = -(x^2-6x+9-49) = -(x-3)^2+49$$

$$x-3 = 7\sin\theta$$

$$dx = 7\cos\theta d\theta$$

$$\sqrt{49-(x-3)^2} = 7\cos\theta$$



$$\int (7\cos\theta)(7\cos\theta d\theta)$$

$$= 49 \int \cos^2\theta d\theta = \frac{49}{2} \int (1 + \cos 2\theta) d\theta$$

$$= \frac{49}{2} [\theta + \sin\theta \cos\theta]$$

$$= \frac{49}{2} \left[\sin^{-1}\left(\frac{x-3}{7}\right) + \frac{(x-3)\sqrt{40+6x-x^2}}{49} \right]$$

$$= \boxed{\frac{49}{2} \sin^{-1}\left(\frac{x-3}{7}\right) + \frac{1}{2}(x-3)\sqrt{40+6x-x^2} + C}$$

Problem 2. (2 pts) Evaluate $\int_1^3 \frac{6x-1}{x^2(x+1)} dx$.

$$\frac{6x-1}{x^2(x+1)} = \frac{A}{x} + \frac{B}{x^2} + \frac{C}{x+1} \quad \begin{matrix} B = -1 \\ C = -7 \end{matrix}$$

$$6x-1 = A(x^2+x) - (x+1) - 7(x^2)$$

$$6x-1 = (A-7)x^2 + (A-1)x - 1 \Rightarrow A=7$$

$$7 \int \frac{dx}{x} - \int x^{-2} dx - 7 \int \frac{dx}{x+1} = 7 \ln|x| + \frac{1}{x} - 7 \ln|x+1| \Big|_1^3$$

$$= (7 \ln 3 + \frac{1}{3} - 7 \ln 4) - (0 + 1 - 7 \ln 2)$$

$$= 7 \ln 3 - 14 \ln 2 - \frac{2}{3} + 7 \ln 2 = 7(\ln 3 - \ln 2) - \frac{2}{3}$$

$$= \boxed{7 \ln \frac{3}{2} - \frac{2}{3}}$$