

Solution to the "complete the square" quiz.

Complete the square in the denominator & indicate the (trig) substitution for

$$\int \frac{dx}{3+3x-x^2}$$

① $3+3x-x^2 = \pm u^2 \pm a^2$??? well...

$$\begin{aligned} 3+3x-x^2 &= -[x^2 - 3x - 3] \\ &= -\left[\underbrace{\left(x - \frac{3}{2}\right)^2}_{\substack{\parallel \\ x^2 - 3x + \frac{9}{4}}} \left\{ -\frac{9}{4} - 3 \right\} \right] \end{aligned}$$

$$= -\left[\left(x - \frac{3}{2}\right)^2 - \frac{9}{4} - \frac{12}{4} \right]$$

$$= -\left[\left(x - \frac{3}{2}\right)^2 - \frac{21}{4} \right]$$

$$= \boxed{\frac{21}{4} - \left(x - \frac{3}{2}\right)^2}$$

② $\frac{21}{4} - \left(x - \frac{3}{2}\right)^2 = \left(\sqrt{\frac{21}{4}}\right)^2 - \left(x - \frac{3}{2}\right)^2 = "a^2 - u^2" \Rightarrow u = a \sin \theta$

$$\boxed{x - \frac{3}{2} = \sqrt{\frac{21}{4}} \sin \theta}$$