Даниил Дмитриев Фак: 0МІ0600041

Контролна 2

④ $A = \int \frac{\operatorname{arctg}\left(\sqrt{\frac{x}{4-x}}\right)}{\sqrt{x(4-x)}} dx$ ДО $\frac{x}{4-x} \geq 0$

$x \in (0, 4)$

$A = \int \frac{\operatorname{arctg}\sqrt{\frac{x}{4-x}}}{(4-x)\sqrt{\frac{x}{4-x}}} dx$

$\sqrt{\frac{x}{4-x}} = t \Rightarrow t^2 = \frac{x}{4-x}$ $x = 4t^2 - xt^2$

$x = \frac{4t^2}{1+t^2}$

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

$\Rightarrow A = \int \frac{\operatorname{arctg} t}{\frac{4}{1+t^2} \cdot t} d\frac{4t^2}{1+t^2} = \int \frac{\operatorname{arctg} t}{t} \cdot \frac{(1+t^2)}{4} \cdot \frac{8t}{(1+t^2)^2} dt =$

$= \int \frac{\operatorname{arctg} t}{1+t^2} dt = \int \operatorname{arctg} t \, d\operatorname{arctg} t =$

$= \frac{\operatorname{arctg}^2(t)}{2} + C = \frac{\operatorname{arctg}^2\left(\sqrt{\frac{x}{4-x}}\right)}{2} + C$