

Discussion Problems 3 (Thu., Jan. 26)

1. Find $F'(x)$ if

(a) $F(x) = \int_{\sqrt{x}}^{\pi} e^{2t^2} dt,$ (b) $F(x) = \int_{-x}^x \frac{1}{3+t^2} dt.$

2. Compute

$$\lim_{x \rightarrow 0} \frac{\int_2^{2+5x} e^{t^2} dt}{\int_1^{1+x} e^{-t^2} dt}.$$

3. Let $f(x) = x + 1/x$. For which interval $I = [a, a + 2]$, $a > 0$, is the average of f over I minimal?

3. Compute:

(a) $\int \frac{x^2 + 1}{(x - 1)^3} dx$ (b) $\int_2^3 \frac{x^2 + 1}{(x - 1)^3} dx$ (c) $\int \frac{1}{(x^2 + 1) \arctan x} dx$
(d) $\int_0^{\pi/2} \frac{\sin \theta}{1 + \cos^2 \theta} d\theta$ (e) $\int_0^1 (x^2 + 1)^5 x^3 dx$ (f) $\int_0^{\pi/2} \sin x \cdot \cos x \cdot \sqrt{1 - \cos x} dx$