

Question 1:

(a)[3 points] Evaluate $\int \frac{\tan^{-1} x}{1+x^2} dx$.

(b)[3 points] Suppose $\int_0^5 f'(x) dx = 11$, where $f'(x)$ is continuous. If $f(0) = -2$, what is $f(5)$?

(c)[4 points] Suppose the average value of $f(x) = 6x(x-1)$ over the interval $x = 0$ to $x = k$ is k . What is k ?

Question 2 [10 points]: Evaluate $\frac{9}{4} \int_1^4 \sqrt{t} \ln t \, dt$.

Question 3 [10 points]: Evaluate

$$\int \frac{x^2}{16\sqrt{16-x^2}} dx$$

Question 4 [10 points]: Evaluate

$$\int \frac{3x^2 + 8}{x^3 + 4x} dx$$

Question 5 [10 points]: Evaluate

$$\int_0^{\pi/3} \sin^7(3t) \cos^3(3t) dt$$