

**Question 1:**

(a)[4] Suppose  $\int_a^b f(x) dx = a$  and  $\int_a^b g(x) dx = b$ . What is the average value of  $f(x) - g(x)$  over the interval  $[a, b]$ ? Simplify your final answer.

(b)[3] Determine  $\int e^{2x} \sin(e^{2x}) dx$ .

(c)[3] Evaluate  $\int_{-\sqrt{3}}^{\sqrt{3}} \frac{4x}{\sqrt{x^2 + 1}} dx$ .

Question 2:

(a)[4] Determine  $\int \arctan(t) dt$ .

(b)[6] Determine  $\int x(\ln(x))^2 dx$ .

Question 3:

(a)[7] Determine  $\int \tan^3(x) \sec^5(x) dx$ .

(b)[3] Evaluate  $\int_0^1 \cos^2(\pi x) dx$ .

Question 4 [10 points]: Determine  $\int \frac{\sqrt{9-x^2}}{x^2} dx$ .

Question 5 [10 points]: Determine  $\int \frac{1}{(x-2)(x+1)^2} dx$ .