Assignment 13 (2/18)

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Problem 1

Problems $7.3.(8, 10, 27, 30, 36)$.

Problem 2

Problems $7.3.(47, 61, 73)$.

Problem 3

Recall that

$$\int_a^b f(x)dx = \int_a^b f(a+b-x)dx. \qquad (\star)$$

Prove that

$$\int_0^{\pi/2} \log(\tan(x))dx = 0.$$

Problem 4

1. Prove that
$$\int_0^{2a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx & \text{if } f(2a-x) = f(x) \\ 0 & \text{if } f(2a-x) = -f(x) \end{cases}$$
2. Prove that
$$\int_0^{\pi/2} \log(\sin(2x))dx = \int_0^{\pi/2} \log(\sin(x))dx.$$
3. Use part (2) and $(\star)$ to evaluate
$$\int_0^{\pi/2} \log(\sin(x))dx.$$

Problem 5

Use the result of problem (4.3) to evaluate

$$\int_0^{\pi/2} \log(\tan\theta + \cot\theta) d\theta.$$