Assignment 14 (5/11)

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Problem 1

Find the following limits.

(a) $\lim_{x\to 0} x\ln(\sin(x))$

(b) $\lim_{x\to 0}(\cot x - \csc x)$

(c) $\lim_{x\to 0}\left(1+\frac{x}{p}\right)^{1/x}$

(d) $\lim_{x\to 0}\dfrac{\log_{\sec\frac{x}{2}}\cos x}{\log_{\sec x}\cos\frac{x}{2}}$

Problem 2

If

$$\lim_{x\to a}\frac{a^x - x^a}{x^x - a^a} = -1,$$

prove that $a = -1$.

Problem 3

Find the following limit or prove that it does not exist.

$$\lim_{x\to 1}\frac{\sqrt{1-\cos 2(x-1)}}{x-1}$$

Problem 4

Show that

$$\int_{-\infty}^{\infty}\sin x\,dx \text{ diverges}$$

although

$$\lim_{b\to\infty}\int_{-b}^{b}\sin x\,dx = 0.$$

Explain why the two answers don't match.

Problem 5

Problem $11.7.(15, 25, 29, 28, 39)$.

Problem 6

Problems $12.1.(19, 25, 26)$.