MATH 54 SUMMER 2017, QUIZ 31

Suppose that f and g are continuous functions defined on the interval $[-\pi, \pi]$ and that for any positive integer n,

$$\int_{-\pi}^{\pi} f(x)\sin(nx)\,dx = 0 \qquad \int_{-\pi}^{\pi} f(x)\cos(nx)\,dx = \frac{1}{n^2} \qquad \int_{-\pi}^{\pi} f(x)\,dx = 1$$

$$\int_{-\pi}^{\pi} g(x)\sin(nx)\,dx = 0 \qquad \int_{-\pi}^{\pi} g(x)\cos(nx)\,dx = \frac{1}{n^3} \qquad \int_{-\pi}^{\pi} g(x)\,dx = 2$$

Find the Fourier series of $3f(x)-5g(x)$. [Hint: for any positive integer n, $\int_{-\pi}^{\pi} \cos^2(nx)\,dx = \pi$ and $\int_{-\pi}^{\pi} 1\,dx = 2\pi$.]