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

\[
\begin{align*}
\int_{-\pi}^{\pi} f(x) \sin(nx) \, dx &= 0 \\
\int_{-\pi}^{\pi} f(x) \cos(nx) \, dx &= \frac{1}{n^2} \\
\int_{-\pi}^{\pi} f(x) \, dx &= 1 \\
\int_{-\pi}^{\pi} g(x) \sin(nx) \, dx &= 0 \\
\int_{-\pi}^{\pi} g(x) \cos(nx) \, dx &= \frac{1}{n^3} \\
\int_{-\pi}^{\pi} g(x) \, dx &= 2
\end{align*}
\]

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