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SYMMETRIC DERIVATIVES AND SYMMETRIC INTEGRALS *

In this talk I will speak about several symmetric derivatives, their related integrals, and the problem in trigonometric series which has motivated their study. In particular I wish to report on some work done jointly with David Preiss on the approximate symmetric integral that will appear in the Canadian Mathematics Journal.

1. Symmetric derivatives. From the family of symmetric derivatives we consider the following variants:

- (ordinary symmetric derivative)

$$\mathrm{SD}f(x) = \lim_{h\to 0} \frac{F(x+h) - F(x-h)}{2h}.$$

- (second order symmetric derivative)

$$\mathrm{SD}^2F(x) = \lim_{h\to 0} \frac{F(x+h) + F(x-h) - 2F(x)}{h^2}.$$

- (symmetric Borel derivative)

$$\mathrm{SBD}F(x) = \lim_{h\to 0} \frac{1}{h} \int_0^h \frac{F(x+t) - F(x-t)}{2t}\, dt$$

- (symmetric Cesàro derivative)

$$\mathrm{SCD}F(x) = \lim_{h\to 0} \frac{1}{h^2} \left\{ \int_x^{x+h} F(t)\, dt - \int_{x-h}^{x} F(t)\, dt \right\}$$

*This article represents, more or less, the contents of a talk given at the Thirteenth Real Analysis Symposium at Michigan State University on June 16, 1989.