

## cubic\_spline\_deriv\_midp

The Derivative of a single-parameter cubic spline at ( $t = 0.5$ ).

$$w = 1 - t = \frac{1}{2}.$$

$$w, t \geq 0.$$

$$b(t, w) = a_1 w^3 + 3 a_2 w^2 t + 3 a_3 w t^2 + a_4 t^3.$$

$$db = 3 a_1 w^2 dw + 6 a_2 t w dw + 3 a_2 w^2 dt + 6 a_3 w t dt + 3 a_3 t^2 dw + 3 a_4 t^2 dt.$$

$$db = -3 a_1 \frac{1}{4} dt - 6 a_2 \frac{1}{2} \frac{1}{2} dt + 3 a_2 \frac{1}{4} dt + 6 a_3 \frac{1}{2} \frac{1}{2} dt - 3 a_3 \frac{1}{4} dt + 3 a_4 \frac{1}{4} dt.$$

$$db = -\frac{3}{4} a_1 dt - \frac{3}{2} a_2 dt + \frac{3}{4} a_2 dt + \frac{3}{2} a_3 dt - \frac{3}{4} a_3 dt + \frac{3}{4} a_4 dt.$$

$$\frac{db}{dt} = -\frac{3}{4} a_1 - \frac{3}{2} a_2 + \frac{3}{4} a_2 + \frac{3}{2} a_3 - \frac{3}{4} a_3 + \frac{3}{4} a_4.$$

$$\frac{db}{dt} = -\frac{3}{4} a_1 - \frac{3}{4} a_2 + \frac{3}{4} a_3 + \frac{3}{4} a_4.$$

$$\frac{db}{dt} = \frac{3}{4} (-a_1 - a_2 + a_3 + a_4).$$