The Derivative

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Update: (reload/refresh your browser):

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Food for thought: ☺

$$y'(c\tau) = y\left(c\tau'\right) = \frac{x(ct)}{y(v\tau')}x(c\tau) + z(c\tau')$$
$$z(c\tau') = 0$$
$$y(ct') = \frac{x(ct)}{y(v\tau')}x(c\tau) = A\left[x(c\tau)\right]$$

$x(c\tau)$ and $y(v\tau')$ are prime numbers for $z(c\tau') = 0$.

$$A = \lim_{h \to 0} \frac{f\left(x+h\right) - f(x)}{h}$$
$$h = y(v\tau')$$
$$A = \lim_{y(v\tau') \to 0} \frac{f\left(x\left(c\tau\right) + y(v\tau')\right) - f(x\left(c\tau\right))}{y(v\tau')}$$
$$A = f'(x(c\tau)) = f(x(c\tau)') = f(x(c\tau')) = \lim_{y(v\tau') \to 0} \frac{f\left(x\left(c\tau\right) + y(v\tau')\right) - f(x\left(c\tau\right))}{y(v\tau')}$$

You might be amused at this discussion of the definition of the derivative. (I can't imagine that no one has done this since Samuel Johnson threw his shoe at Bishop Berkeley..:)

Consider the equation of a straight line in Cartesian Coordinates, and change the coordinate system conceptually to a radial system where $y=r'$ and $x=r$

$$y = Ax + b$$
$$r' = Ar + b$$
$$(r')^2 = (Ar)^2 + b^2 + 2(Ar)b$$
$$(r')(r')^* = (Ar + ib)(Ar - ib) = (Ar)^2 + b^2$$

$$f'(r') = \lim_{b\to 0}\left((r')^2\right) = \lim_{b\to 0}\left(((Ar)^2 + b^2 + 2Arb)\right) = (Ar)^2$$
$$f'\left[(r')(r')^*\right] = \lim_{b\to 0}\left[(Ar)^2 + b^2\right) = (Ar)^2$$

The limit is the same in both cases, where the change is from 2nd order (e.g., square, circle, energy) to first order (line, momentum). Notice that the "derivative" is identical for both the real and conjugate forms; this has profound consequences for String Theory (TRUST me….:)

The variable "b" is the "separation" of the line from the origin (corresponding to Einstein's term in GTR), and is the "disconnect" between the affine vectors $\sin\theta$ and $\cos\theta$ in the relativistic unit circle. At the (nonexistent) "origin". It corresponds to the concept of "neighborhood" shrinking to zero in the differential calculus (and is responsible for a lot of unnecessary confusion in lower division students).

Since the derivatives are the same for both forms, "taking the derivative" in the tensor calculus (an oxymoron) corresponds to diagonalizing the tensor while ignoring the interaction area.

Or are they the same? (exercise for the student). Think of the distinction between the definition of A as the slope of a line and as the definition of the derivative where:

$$A = \lim_{b\to 0}\left(\frac{f(r+h) - f(r)}{h}\right) = \lim_{b\to 0}\left(\frac{f(r'+h) - f(r')}{h}\right)$$

Can one really make the identification $b=h$?

$$(r')^n = \lim_{h\to 0}(r+h)^n = \lim_{h\to 0}\left[r^n + h^n + rem(r,h,n)\right] = \lim_{h\to 0}\left[r^n + h^n + rem(r,h,n)\right]$$

$$A(r')^n = A\left(\lim_{h\to 0}(r+h)^n\right)$$

$$A(r')^2 = A\left(\lim_{h\to 0}(r+h)^2\right) = \left(\lim_{h\to 0}(r^2 + h^2 + 2rh)\right) = A(r)^2$$

$$A(r_*)(r_*)^* = A\left(\lim_{h\to 0}(r_* + ih)(r_* - ih)\right) = \left(\lim_{h\to 0}(r^2 + h^2)\right) = A(r)^2$$

$$(r_*')^n = \lim_{h\to 0}\left[(r+ih)^{\frac{n}{2}}\right]\left[(r-ih)^{\frac{n}{2}}\right] \neq \lim_{h\to 0}(r+h)^n = \left[\lim_{h\to 0}(r+h)^{\frac{n}{2}}\right]^2 = \lim_{h\to 0}(r+h)^n$$

From the Relativistic Unit circle,

$$A = \tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\beta}{\left(\frac{1}{\gamma}\right)} = \beta\gamma = \sinh\theta$$

$$A = 0 \Leftrightarrow v = 0 \Leftrightarrow \left[\left(\frac{c\tau}{c\tau}\right) = 1\right] \vee \left[\left(\frac{c\tau'}{c\tau'}\right) = 1\right]$$

$$\varphi = (\gamma + \beta)$$

$$\varphi^2 = (\gamma+\beta)^2 = \gamma^2 + \beta^2 + 2\beta\gamma$$

$$2\beta\gamma = 0 \Leftrightarrow \theta = 0$$

$$\psi = \gamma + i\beta$$

$$\psi\psi^* = (\gamma + i\beta)(\gamma - i\beta) = \gamma^2 + \beta^2$$

$$i = \sqrt{-1} = 0$$

Trust Me, and send beer and pizza….

$$c_1^{\,2} = (a+b)^2 = a^2 + b^2 + 2ab$$

$$\log_2 (a+b)^2 = 2\log_2 (a+b)$$

$$\exp_2 \left[\log_2 (a+b)^2 \right] = (a+b)^2$$

$$c_2^{\,2} = (c+d)^2 = c^2 + d^2 + 2cd$$

$$\frac{c_1^{\,2}}{(a^2+b^2)} = \frac{a^2}{(a^2+b^2)} + \frac{b^2}{(a^2+b^2)} + 2\left[\frac{ab}{(a^2+b^2)} \right] = p_1$$

$$\frac{c_2^{\,2}}{c^2+d^2} = \frac{c^2}{(c^2+d^2)} + \frac{d^2}{(c^2+d^2)} + 2\left[\frac{cd}{(c^2+d^2)} \right] = p_2$$ a prime number

$$p_1 + p_2 = \frac{c_1^{\,2}}{(a^2+b^2)} + \frac{c_2^{\,2}}{c^2+d^2}$$

$$\frac{c_2^{\,2}}{c^2+d^2}$$ a prime number