Problem of the week #9

Due November 1st

Problem. Do one of the following:

(a) Find, with explanation, a third order differential equation whose general solution on an open interval is $y = (ax + b)/(cx + d)$, where a, b, c, d are constants (and $-d/c$, if defined, is not in the interval) .

(b) Find, with explanation, the function of the form $(ax + b)/(cx + d)$ which best approximates a twice-differentiable function $f(x)$ near a point $x = w$. For example, you may express a, b, c, d in terms of the values $f(w), f'(w), f''(w)$. Your function does not need to be written precisely in the given form, though it must be equivalent.

(For comparison, the best function of the form $ax + b$ is the first two terms $f(w) + f'(w)(x - w)$ of f's Taylor series around $x = w$.)

Bonus credit for doing both.

- Partial credit may be given for partial answers.

- Each POW will be due the following week at 1pm.

- Questions? Email: `bthorner@unomaha.edu`

- Submit solutions to (above email), DSC 210, or DSC 203.

- POWs, solutions, backgrounds, leaderboard available at

`https://www.unomaha.edu/college-of-arts-and-sciences`
`/mathematics/student-opportunities/pow_solutions.php`