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 \( y = \frac{ax + b}{cx + d} \), 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 \( \frac{ax + b}{cx + d} \) 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