MATH 111–05 (Kunkle), Quiz 9 — Name: ______________________________

10 pts, 10 minutes — April 10, 2018

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1 (5 pts). Write as a single logarithm: $4\ln(x-1) - \frac{1}{3}\ln(3x+6) + 2\ln(3x+2)$

2 (5 pts). Write entirely in terms of logs of linear functions: $\log_2\left(\dfrac{x^2-x-2}{4x^2+3x-1}\right)$

Solution:

1.(Source: 5.2.more.3f) Using the properties of logarithms (Theorem 5.2.1, p. 340),

$$\begin{aligned} 4\ln(x-1) - \frac{1}{3}\ln(3x+6) + 2\ln(3x+2) &= \ln(x-1)^4 + \ln(3x+6)^{-1/3} + \ln(3x+2)^2 \\ &= \ln\left((x-1)^4(3x+6)^{-1/3}(3x+2)^2\right), \end{aligned}$$

which, according to the directions, is all that's required. If you like, this could be written as

$$\ln\left(\frac{(x-1)^4(3x+2)^2}{(3x+6)^{1/3}}\right),$$

or even

$$\ln\left(\frac{(x-1)^4(3x+2)^2}{\sqrt[3]{3x+6}}\right)$$

2.(Source: 5.2.more.2i) Factor the quadratics:

$$\log_2\left(\frac{x^2-x-2}{4x^2+3x-1}\right) = \log_2\left(\frac{(x-2)(x+1)}{(4x-1)(x+1)}\right)$$

Cancel the common factor, and then break up using the properties of logs:

$$\log_2\left(\frac{x-2}{4x-1}\right) = \log_2(x-2) - \log_2(4x-1)$$

(done)