

My Dugga-id is:

## Dugga 2, TBMT19, 2014-02-05

3 questions, with 3 points each. 7 points needed to pass. You can answer in Swedish and write on both sides of the paper. Don't forget to write name and personal number on all papers you hand in. If you want to know your results from the public results list: remember your Dugga-id above.

### 1 Model formulation

Consider the following model:

$$d/dt([A]) = u_1 - V_{\max} * [A] / (K_m + [A]) - k_2 * [A]$$

$$d/dt([B]) = k_2 * [A] - u_2$$

$$[A](0) = 0.5, [B](0) = 1. V_{\max} = 2, K_m = 2.5, k_2 = 3.$$

$$y_{\text{hat}}(t,p) = k_y * [B] / (K_{m_y} + [B]) \quad k_y = 4, K_{m_y} = 5$$

- Which are the reactions? (or alternatively: What is the interaction graph?)
- What are the new equations if the  $k_2$ -reaction is changed into a Michaelis-Menten expression?
- How could you describe the  $y_{\text{hat}}$ -equation in words; what does it mean?

### 2. Statistical tests

- Name at least one benefit of testing a model with respect to independent validation data.
- What is the null-hypothesis of a chi-square test? What do you conclude if it is rejected?
- What do you conclude if you do not reject a likelihood ratio test?

### 3. Closing the loop

- What is the problem with predictions in systems biology? Why does this problem typically not appear in physics?
- You have a well-determined prediction in a model, concerning the concentration of a state B, at a certain time point,  $t=15$ . How could that be a reason to measure B experimentally at that time point?
- You have another prediction, of the reaction rate  $v_2$ , at time point  $t=20$ . This prediction, however, is very uncertain, more than that of many other predictions. How could that uncertainty be a reason to measure this rate at this time point?

Good luck! ☺