

BM5063 Mathematical Physiology and Systems Medicine

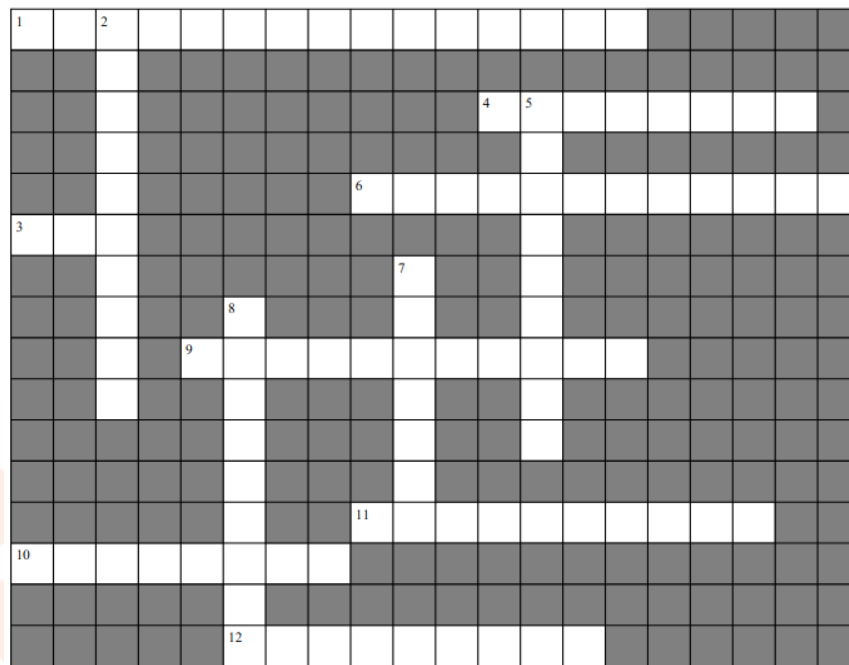
Exam 5

Instructions

1. This exam is open notes where you can use any hand-written material. Photocopies/prints/books/electronic devices are not permitted to be used.
2. Neatness in the answers is expected.

Questions

1. Solve the following crossword puzzle **cleanly**.



Across

- 1 A gene that protects cells from turning cancerous when functioning properly
- 3 A cellular process where epithelial cells gain migratory and invasive properties.
- 4 A gene that, when mutated or overexpressed, promotes cancer development.
- 6 Formation of new blood vessels, often co-opted by tumors to ensure nutrient supply.
- 8 Disordered cell growth often considered precancerous.
- 9 Increase in the number of normal cells in a tissue or organ.
- 10 Uncontrolled cell death typically caused by injury or lack of blood supply.

- 11 A substance or agent capable of causing cancer.

- 12 Programmed cell death that eliminates damaged or unwanted cells.

Down

- 2 The spread of cancer cells from the original site to distant organs.
- 5 The abnormal and uncontrolled growth of cells forming a mass.
- 7 Condition of reduced oxygen availability, common in rapidly growing tumors.

2. For the following equation described in one-dimensional domain $0 \leq x \leq 1$, obtain homogeneous steady state and check its stability.

$$\dot{u} = D \frac{\partial^2 u}{\partial x^2} + \frac{\partial}{\partial x} (v(x)u) + \beta \frac{u}{1+u}$$

where $v(x) = \sin(\pi x)$.



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