MST124 Mini examination paper

This paper has **TWO** sections. You should attempt **ALL** questions in each section.

Section A has 6 questions, each worth 2 marks.
Section B has 2 question, each worth 4 marks.

Each question in Section A is multiple-choice, with **ONE** correct answer from five options. Answer each question by making a mark within the circle to the left-hand side of one of the options given. No marks will be deducted for incorrectly answered questions.

For both questions in Section B, write your answers in the boxes provided. Do not include any working; full marks will be given for a completely correct answer only. No marks will be deducted for incorrectly answered questions.

SECTION A

Question 1

Which of the following is equivalent to $(2 - x)(3x + 1) - 3(1 - x^2)$?

◯ **A** $-x - 1$

◯ **B** -1

◯ **C** $6x - 3$

⊗ **D** $5x - 1$

◯ **E** $-2x^2 - 5x - 1$

Question 2

Which of the following is equivalent to the inequality $\dfrac{1}{x+2} > x - 1$?

◯ **A** $-x^2 - x - 3 > 0$

◯ **B** $\dfrac{-x^2 - x + 3}{x + 2} < 0$

◯ **C** $-x^2 - x - 3 < 0$

⊗ **D** $\dfrac{-x^2 - x + 3}{x + 2} > 0$

◯ **E** $\dfrac{-x^2 - x - 1}{x + 2} > 0$

Question 3

How many values of θ in radians between $-\pi/2$ and $3\pi/2$ satisfy $\cos(\theta) = -1/2$?

◯ **A** 1

⊗ **B** 2

◯ **C** 3

◯ **D** 4

◯ **E** 5

Question 4

What is the derivative of $e^x \cos(x)$?

◯ **A** $e^x \cos(x) + e^x \sin(x)$

◯ **B** $-e^x \sin(x)$

⊗ **C** $e^x \cos(x) - e^x \sin(x)$

◯ **D** $\dfrac{e^x \cos(x) + e^x \sin(x)}{\cos^2(x)}$

◯ **E** $e^x - \sin(x)$

Question 5

On which interval is the function $f(x) = -x^2 + 3x - 2$ increasing?

⊗ **A** $(-\infty, 3/2)$

◯ **B** $(1, 2)$

◯ **C** $[1, 2]$

◯ **D** $(3/2, \infty)$

◯ E $[1, 3/2)$

Question 6

Which of the following is equal to $\int_0^1 \left(\sqrt{x} - 2x\right) \mathrm{d}x$?

◯ **A** $-\frac{2}{3}$

◯ **B** $\frac{1}{2}$

◯ **C** $\frac{1}{3}$

◯ **D** $\frac{2}{3}$

Ⓧ **E** $-\frac{1}{3}$

SECTION B

Question 7

A function f has derivative $f'(x) = 2x^2 + x$. What are the stationary points of f, and their natures?

The x-coordinate of one stationary point is at $x =$ [0].

It is a [local minimum] (options: local maximum, local minimum or horizontal point of inflection).

The x-coordinate of the other stationary point is at $x =$ [$-\frac{1}{2}$].

It is a [local maximum] (options: local maximum, local minimum or horizontal point of inflection).

Question 8

The velocity v (in metres per second) of an object in terms of the time t (in seconds) is given by

$$v = 4t^2 + 1.$$

The displacement of the object at time $t = 1$ is 3 m. What is the displacement of the object (in metres) at time $t = 3$?

The displacement is [0.67] metres (to 2 d.p.) at $t = 3$.

[END OF QUESTION PAPER]