External assessment 2026

Multiple choice question book

Specialist Mathematics

Paper 2 — Technology-active

General instruction

- Work in this book will not be marked.
- Predicted paper written by Tangent Tuition. Not QCAA material.

Section 1

Instruction

- Respond to these questions in the question and response book.

QUESTION 1

A particle moves in a straight line. When its displacement from the origin is x m, its velocity is $v = \sqrt{x^2+9}\ \text{m s}^{-1}$.

Determine the acceleration (m s^{-2}) of the particle when $x = 4$.

(A) 0.8

(B) 4

(C) 5

(D) 8

QUESTION 2

Given that $z = 2 - i$ is a root of $P(z) = z^3 - 7z^2 + 17z - 15$, a factor of $P(z)$ is

(A) $z+3$

(B) z^2+4z+5

(C) z^2-4z+3

(D) z^2-4z+5

QUESTION 3

Let $z = -\sqrt{3}+i$. The value of $\text{Arg}\left(z^4\right)$ is

(A) $-\dfrac{2\pi}{3}$

(B) $\dfrac{5\pi}{6}$

(C) $\dfrac{4\pi}{3}$

(D) $\dfrac{10\pi}{3}$

QUESTION 4

The random variable X has the probability density function

$$f(x) = \begin{cases} 0.25e^{-0.25x} & , \quad x \geq 0 \\ 0 & , \quad \text{otherwise} \end{cases}$$

Rounded to four decimal places, $P(X > 10)$ is

(A) 0.0205

(B) 0.0668

(C) 0.0821

(D) 0.9179

QUESTION 5

The vector equation of the line that passes through the point $A(1, 2, -1)$ and is parallel to the vector $2\hat{\boldsymbol{i}} - \hat{\boldsymbol{j}} + 3\hat{\boldsymbol{k}}$, where t is a scalar, is

(A) $\boldsymbol{r} = \left(2\hat{\boldsymbol{i}} - \hat{\boldsymbol{j}} + 3\hat{\boldsymbol{k}}\right) + t\left(\hat{\boldsymbol{i}} + 2\hat{\boldsymbol{j}} - \hat{\boldsymbol{k}}\right)$

(B) $\boldsymbol{r} = \left(\hat{\boldsymbol{i}} + 2\hat{\boldsymbol{j}} + \hat{\boldsymbol{k}}\right) + t\left(2\hat{\boldsymbol{i}} - \hat{\boldsymbol{j}} + 3\hat{\boldsymbol{k}}\right)$

(C) $\boldsymbol{r} = \left(\hat{\boldsymbol{i}} + 2\hat{\boldsymbol{j}} - \hat{\boldsymbol{k}}\right) + t\left(\hat{\boldsymbol{i}} - 3\hat{\boldsymbol{j}} + 4\hat{\boldsymbol{k}}\right)$

(D) $\boldsymbol{r} = \left(\hat{\boldsymbol{i}} + 2\hat{\boldsymbol{j}} - \hat{\boldsymbol{k}}\right) + t\left(2\hat{\boldsymbol{i}} - \hat{\boldsymbol{j}} + 3\hat{\boldsymbol{k}}\right)$

QUESTION 6

The position vector of a particle at time t is $\boldsymbol{r}(t) = 5\cos(2t)\,\hat{\boldsymbol{i}} + 5\sin(2t)\,\hat{\boldsymbol{j}}$.

The magnitude of the acceleration of the particle is

(A) 10

(B) 20

(C) 40

(D) 100

QUESTION 7

The population, P, of a species satisfies the logistic differential equation

$$\frac{dP}{dt} = 0.42P\left(1 - \frac{P}{3600}\right)$$

where $P = 240$ when $t = 0$.

The solution of the differential equation can be expressed as

$$P = \frac{K}{1 + Ae^{-0.42t}}$$

where K and A are constants.

The values of K and A are

(A) $K = 3600$ and $A = 14$

(B) $K = 3600$ and $A = 15$

(C) $K = 3600$ and $A = \frac{1}{14}$

(D) $K = 1800$ and $A = 6.5$

QUESTION 8

A random sample of 40 students completed a puzzle. The sample mean time was 41.62 seconds and the sample standard deviation was 2.30 seconds.

An approximate 90% confidence interval for the population mean time (seconds) is

(A) $(37.84,\ 45.40)$

(B) $(40.91,\ 42.33)$

(C) $(41.02,\ 42.22)$

(D) $(41.15,\ 42.09)$

QUESTION 9

Values of a function f are shown in the table.

t	0	2.5	5	7.5	10	12.5	15	17.5	20
$f(t)$	12.0	13.1	14.6	16.4	18.9	22.0	25.9	30.4	35.6

Use Simpson's rule with all the values in the table to determine an approximation for $\int_0^{20} f(t)\,dt$.

(A) 374.2

(B) 411.7

(C) 412.8

(D) 1235.0

QUESTION 10

The position vector (m) of a stone t seconds after it is thrown is

$$\boldsymbol{r}(t) = 18\cos(25^\circ)\,t\,\hat{\boldsymbol{\imath}} + \left(18\sin(25^\circ)\,t - 4.9t^2\right)\hat{\boldsymbol{\jmath}}$$

Determine the speed ($\mathrm{m\,s^{-1}}$) of the stone when $t = 2$.

(A) 9.80

(B) 18.00

(C) 20.25

(D) 28.31

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