

A2 Maths with Mechanics Test λ (lambda) Version O

1 Integrate $\cos^2 x$ with respect to x

2 Show that $x^3 - x + 3 = 0$ has a root in the interval $(-3,3)$

3 Solve the equation $2 \ln 2x - 6 \ln 2 = \ln (x-3)$ Give an exact answer

4 A curve has equation $x \sin y = 1 - x^2 \cos y$ Find $\frac{dy}{dx}$ in terms of x and y .

5. The area under the curve $y = \ln x$, is bounded by the x - axis and the line $x = 5$.

(a) Estimate the area of the shaded region to 3 decimal places using the trapezium rule with 4 strips.

(b) Given that $\int \ln x \, dx = x \ln x - x + c$, find the true value of the area correct to 3 decimal places.

(c) Calculate the percentage error of the trapezium rule approximation.

6. A field 100m in length has two barriers of height 2m at a distance of 5m from both ends. A ball is kicked with speed 25m/s. What is the minimum angle the ball would need to be kicked at to the horizontal to clear both walls.

A2 Maths with Mechanics Test λ (lambda) Version P

1 Integrate $\sin^2 x$ with respect to x

2 Show that $x^3 - x + 3 = 0$ has a root in the interval $(-2,2)$

3 Solve the equation $2 \ln 4x - 6 \ln 2 = \ln (2x-3)$ Give an exact answer

4 A curve has equation $2x \sin y = 2 - x^2 \cos y$ Find $\frac{dy}{dx}$ in terms of x and y .

5. The area under the curve $y = 2 \ln x$, is bounded by the x - axis and the line $x = 5$.

(a) Estimate the area of the shaded region to 3 decimal places using the trapezium rule with 4 strips.

(b) Given that $\int \ln x \, dx = x \ln x - x + c$, find the true value of the area correct to 3 decimal places.

(c) Calculate the percentage error of the trapezium rule approximation.

6. A field 100m in length has two barriers of height 2m at a distance of 4m from both ends. A ball is kicked with speed 25m/s. What is the minimum angle the ball would need to be kicked at to the horizontal to clear both walls.

A2 Maths with Mechanics Test λ (lambda) Version Q

1 Integrate $\cos^2 2x$ with respect to x

2 Show that $x^3 - x + 3 = 0$ has a root in the interval $(-2,-1)$

3 Solve the equation $2 \ln 6x - 6 \ln 2 = \ln (3x-3)$ Give an exact answer

4 A curve has equation $2x \sin y = 2 + x^2 \cos y$ Find $\frac{dy}{dx}$ in terms of x and y .

5. The area under the curve $y = 3 \ln x$, is bounded by the x - axis and the line $x = 5$.

- Estimate the area of the shaded region to 3 decimal places using the trapezium rule with 4 strips.
- Given that $\int \ln x \, dx = x \ln x - x + c$, find the true value of the area correct to 3 decimal places.
- Calculate the percentage error of the trapezium rule approximation.

6. A field 100m in length has two barriers of height 1m at a distance of 6m from both ends. A ball is kicked with speed 25m/s. What is the minimum angle the ball would need to be kicked at to the horizontal to clear both walls.

A2 Maths with Mechanics Test λ (lambda) Version R

1 Integrate $\sin^2 2x$ with respect to x

2 Show that $x^3 - x + 3 = 0$ has a root in the interval $(-1.7,-1.6)$

3 Solve the equation $20 \ln 6x - 60 \ln 2 = 10 \ln (3x-3)$ Give an exact answer

4 A curve has equation $2x \sin 2y = 2 + x^2 \cos 2y$ Find $\frac{dy}{dx}$ in terms of x and y .

5. The area under the curve $y = 5 \ln x$, is bounded by the x - axis and the line $x = 5$.

- Estimate the area of the shaded region to 3 decimal places using the trapezium rule with 4 strips.
- Given that $\int \ln x \, dx = x \ln x - x + c$, find the true value of the area correct to 3 decimal places.
- Calculate the percentage error of the trapezium rule approximation.

6. A field 100m in length has two barriers of height 3m at a distance of 7m from both ends. A ball is kicked with speed 25m/s. What is the minimum angle the ball would need to be kicked at to the horizontal to clear both walls.

Answers Version O

1 $\frac{1}{2}x + \frac{1}{4}\sin 2x + c$

2 Proof

3 $x = 4$ or $x = 12$

4 $\frac{dy}{dx} = \frac{\sin y + 2x \cos y}{x^2 \sin y - x \cos y}$

5 (a) 3.983 (3 d.p.)

5 (b) 4.047 (3 d.p.)

5 (c) 1.59%

6 24°

Answers Version P

1 $\frac{1}{2}x - \frac{1}{4}\sin 2x + c$

2 Proof

3 $x = 2$ or $x = 6$

4 $\frac{dy}{dx} = \frac{2\sin y + 2x \cos y}{x^2 \sin y - 2x \cos y}$

5 (a) 7.966 (3 d.p.)

5 (b) 8.094 (3 d.p.)

5 (c) 1.59%

6 28°

Answers Version Q

1 $\frac{1}{2}x + \frac{1}{8}\sin 4x + c$

2 Proof

3 $x = 4$ or $x = \frac{4}{3}$

4 $\frac{dy}{dx} = \frac{-2\sin y + 2x \cos y}{x^2 \sin y + 2x \cos y}$

5 (a) 11.948 (3 d.p.)

5 (b) 12.142 (3 d.p.)

5 (c) 1.59%

6 12°

Answers Version R

1 $\frac{1}{2}x - \frac{1}{8}\sin 4x + c$

2 Proof

3 $x = 4$ or $x = \frac{4}{3}$

4 $\frac{dy}{dx} = \frac{-\sin 2y + x \cos 2y}{x^2 \sin 2y + 2x \cos 2y}$

5 (a) 19.914 (3 d.p.)

5 (b) 20.236 (3 d.p.)

5 (c) 1.59%

6 26°