

Jacqueline Tyler Set B Paper 1

Recommended time: 75 minutes

Calculators: not permitted

Format: 20 multiple-choice questions

This community paper is presented in a clean, print-ready format. The wording, mathematics, answer choices, and diagrams are preserved directly from the author-hosted source PDF.

Paper guidance

- Attempt every question and select the best answer from the choices given.
- Diagrams are reproduced directly from the source and may not be drawn to scale.
- This question paper does not include worked solutions or a marked answer key.

Best of luck, and enjoy the challenge!

Source credit: Jacqueline Tyler

1. Find the value of $\int_1^2 6\sqrt{x} + \frac{16}{x^3} \, dx$

A $8\sqrt{2} - 10$

B $4\sqrt{8} - \frac{1}{4}$

C $8\sqrt{2} + 2$

D $4\sqrt{8} + \frac{1}{4}$

E $4\sqrt{2} + 6$

2. How many solutions does the following equation have in the range $0 \leq x \leq 2\pi$

$$\sin 2x + \sin^2 x = 1$$

- A 2
- B 3
- C 4
- D 6
- E 8
- F infinitely many

3. What is the shortest distance from the point A (5 , 0) to the curve with equation $y = x^2 + 1$
- A $\sqrt{5}$
 - B $2\sqrt{2}$
 - C $2\sqrt{5}$
 - D 5
 - E $5\sqrt{2}$

4. Consider an arithmetic sequence with $(2n + 1)$ terms.

What is the ratio of the sum of odd terms to the sum of even terms?

- A $n^2 : n^2 - 1$
- B $n + 1 : n$
- C $n : n - 1$
- D $n + 1 : n - 1$
- E $n(n + 1) : 2n + 1$

5. Find the sum of the solutions of the equation $x^2 + 2\sqrt{x^2 + 6x} = 24 - 6x$
- A - 6
 - B - 2
 - C 2
 - D 6
 - E 10

6. The function f is given by $f(x) = \left(\frac{1}{x} - \frac{2}{x^2}\right)^2$ $x \neq 0$
What is the value of $f''(1)$

- A - 6
- B - 2
- C 26
- D 38
- E 122

7. A sequence is defined by $u_n = \sum_{r=0}^{n-1} u_r$ and $u_0 = 1$

Evaluate $\sum_{r=0}^{\infty} \frac{1}{u_r}$

- A the sum does not converge
- B 1
- C 2
- D 3
- E $\frac{2}{3}$

8. Given that $3^a = 16$ and $2^b = 27$, find the value of ab

A 3

B $\frac{7}{2}$

C 4

D $\frac{9}{2}$

E 12

9. In a set of k consecutive integers, the largest number is 23. What is the mean of the set?

A $\frac{1}{2}(k + 45)$

B $25 - 2k$

C $\frac{23}{2}k$

D $\frac{1}{2}(25 - k)$

E $\frac{1}{2}(47 - k)$

10. Evaluate the following integral $\int_0^{\pi} x|x-4| \, dx$

A $-\frac{32}{3}$

B $-\frac{16}{3}$

C $\frac{16}{3}$

D $\frac{32}{3}$

E 0

11. Which of the following is the largest?

A $2^{\frac{1}{2}}$

B $3^{\frac{1}{3}}$

C $4^{\frac{1}{4}}$

D $6^{\frac{1}{6}}$

E $12^{\frac{1}{12}}$

12. Two players take it in turns to throw a fair six-sided die until one of them scores a six. What is the probability that the first player to throw the die is the first to score a six?

A $\frac{3}{5}$ B $\frac{4}{7}$ C $\frac{5}{9}$ D $\frac{6}{11}$ E $\frac{7}{12}$

13. How many real roots does the equation $12x^5 - 45x^4 + 40x^3 - 10$ have?

A 1

B 2

C 3

D 4

E 5

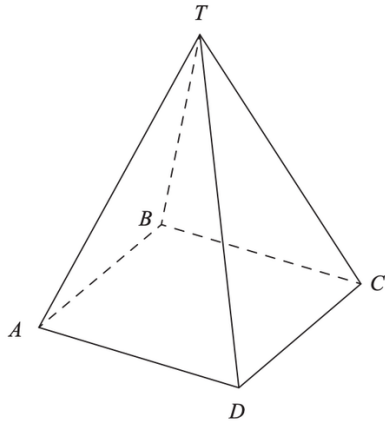
14. Find the coefficient of x^4y^2 in the expansion of $(1 + x^2 + y)^6$

- A 6
- B 15
- C 30
- D 90
- E 120

15. Find the minimum value of $f(x) = 25\sin^4 x - 30\sin^2 x + 11$

- A 1
- B 2
- C 5
- D 8
- E 11

16. A square based pyramid, with base ABCD, and vertex T has all edges of length 2m.
Find the shortest distance, in metres, along the outer surface of the prism from the midpoint of AB to the midpoint of CT.



- A $\sqrt{3} - 1$
B 2
C $\sqrt{2} + 1$
D $\sqrt{4 + \sqrt{3}}$
E $2\sqrt{2}$

17. Three geometric transformations are defined as follows:
- R is a reflection in the y -axis
 - S is a stretch parallel to the x -axis, scale factor $1/2$
 - T is a translation by 3 units in the negative x direction

These three transformations are applied to the graph of $y = \sqrt{x}$ resulting in the graph of $y = \sqrt{3 - 2x}$

In which order were the transformations applied?

- A R then S then T
- B R then T then S
- C S then R then T
- D S then T then R
- E T then S then R

18. The curve C has equation $y = x^2 + bx + 3$ where $b \geq 0$

Find the value of b that minimises the distance between the origin and the stationary point of the curve C .

- A $b = 0$
- B $b = 2$
- C $b = \sqrt{6}$
- D $b = \sqrt{10}$
- E $b = 10$

19. How many solutions does the following equation have in the range $0 \leq x < 2\pi$

$$2 = \sin x + \sin^2 x + \sin^3 x + \sin^4 x + \dots$$

- A 0
- B 1
- C 2
- D 3
- E infinitely many

20. The polynomial function $f(x)$ is such that $f(x) > 0$ for all values of x .

Given that $\int_2^4 f(x) \, dx = A$ and $\int_4^6 f(x) \, dx = B$

evaluate $\int_{-2}^2 f(x+4) + 2 \, dx$ in terms of A and B

A $A + B$

B $2(A + B)$

C $A + B + 2$

D $A + B + 8$

E $4(A + B) + 2$