

## Pure math – Model 2

1. The coefficient of  $T_5$  in the expansion of  $(1 + 2x)^{10}$  according to the ascending power of  $x$  is ...

- a)  $16 \times {}^{10}C_5$                       b)  $\frac{1}{16} \times {}^{10}C_5$   
c)  $16 \times {}^{10}C_4$                       d)  $\frac{1}{16} \times {}^{10}C_4$

2. The distance between the point  $(6,7,8)$  and the  $y$ -axis is ...

- a) 12                      b) 10                      c) 8                      d) 6

3. If  $\sin x = \cos y$ , where  $x, y \in ]0, \pi[$ , then  $\frac{dy}{dx} = \dots$

- a) zero                      b) -1                      c)  $\frac{\pi}{2}$                       d)  $\frac{-\cos x}{\sin y}$

4.  $\int e^{\sec^2 x - \tan^2 x} dx = \dots$

- a) zero                      b)  $e^x$                       c)  $ex$                       d)  $e$

5. The value of the term free of  $x$  in the expansion  $\left(\frac{x+1}{x^{2/3}-x^{1/3}+1} - \frac{x-1}{x-x^{1/2}}\right)^{10}$  equals ...

- a) 210                      b) 105                      c) 70                      d) 112

6. If  $\vec{A} = (-2, 0, 3)$ ,  $\vec{B} = (4, 2, -5)$ , then  $\overrightarrow{AB} = \dots$

- a)  $(-6, -2, 8)$                       b)  $(2, 2, -2)$   
c)  $(6, 2, -8)$                       d)  $(1, 1, -1)$

7. If  $y = x \sin x$ , then  $x \frac{d^3 y}{dx^3} + x \frac{dy}{dx} = \dots$

- a)  $2x$                       b)  $2y$                       c)  $3xy$                       d)  $-2y$

8. The volume of the solid generated by rotating the region bounded between  $y = x^3 + 1, y = 0, x = 1$  a complete revolution about the  $x$ -axis = ... cubic units

- a)  $\frac{14}{23}\pi$       b)  $\frac{16}{7}\pi$       c)  $\frac{20}{23}\pi$       d)  $\frac{11}{23}\pi$

9. The value of  $\log_{16} \left( \frac{4+\omega+2\omega^2}{\omega^2+1} + \frac{\omega^2-1}{2+\omega+2\omega^2} \right) = \dots$

- a)  $\frac{1}{4}$       b)  $\frac{1}{2}$       c)  $\frac{1}{3}$       d) 1

10. If  $\|\vec{A} \times \vec{B}\|^2 + (\vec{A} \cdot \vec{B})^2 = 144$  and  $\|\vec{A}\| = 4$ , then  $\|\vec{B}\| = \dots$

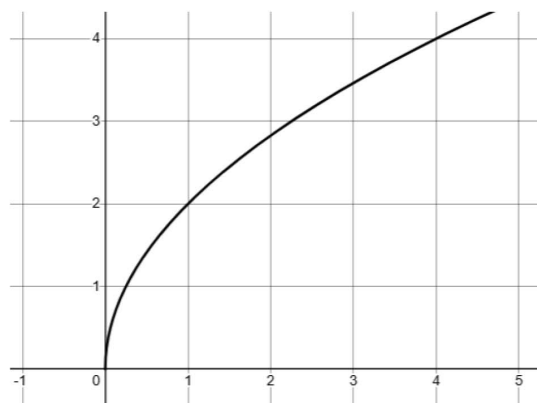
- e) 3      b) 4      c) 5      d) 6

11. A point moves along the curve  $x^2 + y^2 - 4x + 8y - 6 = 0$ , and the rate of change of the  $x$ -coordinate at the point (3,1) is 4, then the rate of change of the  $y$ -coordinate is...

- a)  $\frac{3}{5}$       b)  $\frac{4}{5}$       c)  $\frac{-4}{5}$       d)  $\frac{-3}{5}$

12. The area of the region bounded by the curve  $y = \sqrt{kx}$  and the straight lines  $x = 9$  and  $y = 0$  is .... Square units

- a) 6      b) 12  
c) 24      d) 36



13. The exponential form of the complex number  $z = 2 + 2\sqrt{3}i$  is ...

- a)  $4e^{-\frac{\pi}{3}i}$       b)  $4e^{\frac{\pi}{3}i}$       c)  $4e^{-\frac{\pi}{6}i}$       d)  $4e^{\frac{\pi}{6}i}$

14.  $\sin^2 \theta_x + \sin^2 \theta_y + \sin^2 \theta_z = \dots$   
a) -1                      b) 1                      c) 2                      d) 3

15. The curve of the function  $f(x) = x^4 - 24x^2 + 4$  is convex downward on the interval ...  
a)  $] -\infty, 2[$                       b)  $] -\infty, -2]$   
c)  $] -2, 2[$                       d)  $R - [-2, 2]$

16. The trigonometric form of the complex number  $z = -\sqrt{3} + i$  is ...  
a)  $3(\cos 150^\circ + i \sin 150^\circ)$   
b)  $2(\cos 150^\circ + i \sin 150^\circ)$   
c)  $2(\sin 150^\circ + i \cos 150^\circ)$   
d)  $\cos 150^\circ + i \sin 150^\circ$

17. The equation of the plane passing through the point  $(1, -2, 5)$  and its normal vector  $(2, 1, 3)$  is ...  
a)  $2x + y + 3z = 1$   
b)  $2x + y + 3z = 15$   
b)  $x - 2y + 5z = 15$   
d)  $x + y + z = 4$

18. The function  $f(x) = \frac{x^2+x+1}{x+1}$  is decreasing on ...  
a)  $[-2, 0]$                       b)  $] -1, \infty[$                       c)  $] -2, \infty[$                       d)  $] -2, 0[-\{1\}$

### Essay Questions

19. If  $a = 2 + 3\omega, b = 2 + 3\omega^2$ , then Find the value of  $ab$

20. The sum of three numbers is 36, and the greatest number is twice the smaller, find the three numbers if Their product is maximum.