


Egypt-Japan University of Science and Technology <i>Entrance Exam (Undergraduate)</i>		
Faculty of Engineering	Subject: Mathematics	 الجامعة المصرية اليابانية للعلوم والتكنولوجيا E-JUST Egypt-Japan University of Science and Technology エジプト日本科学技術大学
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Student Name:	Student ID:	

Choose the correct answer

Question 1 Consider the arithmetic sequence $-2, 2, \dots, 4n - 2$. The sum of this sequence equals
 A) $2(n^2 - 1)$ B) $2n^2 + n - 1$ C) $2n^2 - 1$ D) $2n^2 + n + 1$

Question 2 Consider the two points $A(1, -1, 0), B(-2, 1, 2)$. Let \vec{a}, \vec{b} be the position vectors of the two points A, B . Let $\vec{c} = \vec{a} + t\vec{b}$, where t is a real number. The minimum value of $|\vec{c}|$ equals
 A) 1 B) 3 C) 6 D) 9

Question 3 Assume that a die is thrown three times. Let x, y, z be the appearing numbers on the first, second, and third toss, respectively. Define A to be the event where $x = y = z$, and B to be the event where $x + y + z = 6$. The number of elements in B equals
 A) 1 B) 6 C) 10 D) 30

Question 4 Let A be a 3×3 matrix such that $\left(A + \begin{bmatrix} 1 & 2 & 3 \\ 4 & 0 & 10 \\ -1 & 2 & 5 \end{bmatrix} \right)^t = \begin{bmatrix} -1 & 5 & 1 \\ 10 & 2 & 5 \\ 3 & -2 & 9 \end{bmatrix}$ and
 let $A^2 = \begin{bmatrix} a & a_1 & a_2 \\ b_1 & b & b_2 \\ c_1 & c_2 & c \end{bmatrix}$, Then, the value of b is
 A) -24 B) 12 C) 24 D) 20

Question 5 Suppose that $f(t)$ is a linear function in t . Let $F(x) = \int_0^x f(t)dt$. If $F(3) = 6, F'(3) = 5$, then $f(t) =$

- A) $2t - 1$ B) $t - 2$ C) $2t + 1$ D) $t + 2$

Question 6 Evaluate the following integration $\int x e^{-2x} dx$

- A) $-\frac{1}{2}e^{-2x}(x + 1) + c$ B) $-\frac{1}{4}e^{-2x}(2x + 1) + c$
 C) $-\frac{1}{2}e^{-2x}(x - 1) + c$ D) $-\frac{1}{2}e^{-2x}(x - 1) + c$

Question 7 If $\lim_{x \rightarrow 4} \frac{\sqrt{x+a}}{x-4} = b$, where $b \in \mathbb{R}$ then $a - b = \dots\dots\dots$

- A) -6 B) $\frac{-9}{4}$ C) $\frac{-1}{2}$ D) $\frac{-7}{4}$

Question 8 The sum of the first 3 terms of a geometric series is 26, and the sum of the first 6 terms is 728. What is the common ratio?

- A) 2 B) 3 C) 4 D) 5

Question 9 In how many ways can 6 people be seated around a circular table?

- A) 36 B) 120 C) 720 D) 46,656

Question 10 The equation of the tangent line to the function $f(x) = x^2 - 3$ at $x = 2$ is

- A) $y = 0.5x - 1$ B) $y = 2x - 6$ C) $y = -4x + 2$ D) $y = 4x - 7$

Question 11 If $y = (x^2 + 1) \sec(7x)$, then $\frac{dy}{dx}$ equals to

- A) $\sec(7x)(7(x^2 + 1) \tan(7x) + 2x)$ B) $7(x^2 + 1) \sec(7x) \tan(7x) - x \sec(7x)$
C) $7(x^2 + 1) \tan(7x) + 2x \sec(7x)$ D) $(x^2 + 1) \sec(7x) \tan(7x) + 2x \sec(7x)$

A disabled automobile is pulled by means of two ropes as shown. The tension in rope $F_{AB} = 2.2 \text{ KN}$, and the angle $\alpha = 25^\circ$. Knowing that the resultant of the two forces applied at A is directed along the axis of the automobile, as shown in Figure 1,

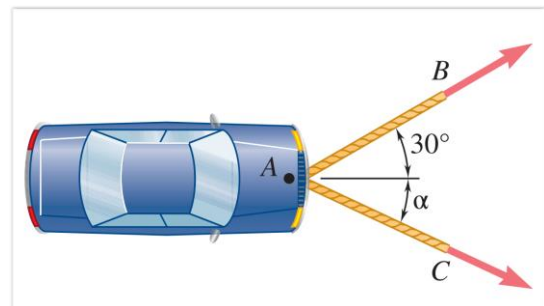


Figure 1

Question 12 The magnitude of the resultant of the two forces applied at A is:

- A) $F_A = 0 \text{ KN}$
B) $F_A = 2.6 \text{ KN}$
C) $F_A = -2.2 \text{ KN}$
D) $F_A = 4.26 \text{ KN}$

Question 13 If the force $F_{AB} = 3 \text{ KN}$ and $\alpha = 25^\circ$, The magnitude of the resultant force F_A is required to be 4.8 KN , then the tension in rope AC, F_{AC} , equals:

- A) $F_{AC} = F_{AB}$
B) $F_{AC} = F_A$
C) $F_{AC} \geq F_{AB}$
D) $F_{AC} \leq F_{AB}$

Question 14

The dragster starts from rest and has a velocity described by the graph, as shown in Figure 2. The total distance traveled during this time interval is:

- A) $s = 2250m$
- B) $s = 0m$
- C) $s = 150m$
- D) $s = 1125m$

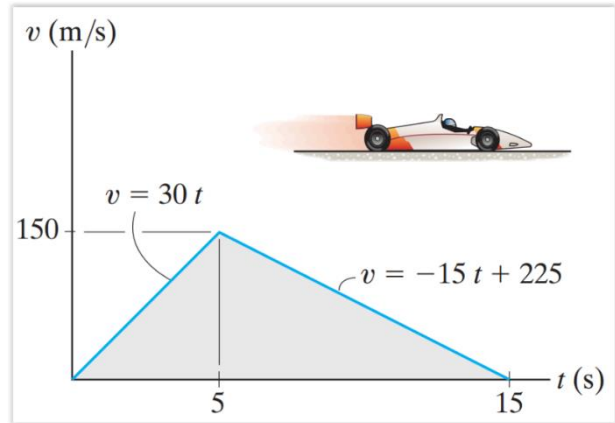


Figure 2

Question 15 A car accelerates uniformly from rest to speed of 30 m/s in 10 seconds. Determine the acceleration and the distance traveled during this time.

- A) $3 \frac{m}{s^2}, 150m$
- B) $2 \frac{m}{s^2}, 200m$
- C) $3 \frac{m}{s^2}, 300m$
- D) $2 \frac{m}{s^2}, 150m$

Best Wishes