

2014 新东方在线考研终极模考

数学(III) 参考答案

一、选择题

- (1) A (2) C (3) D (4) D (5) C (6) D (7) B (8) C

二、填空题

(9) $-\frac{x}{8\sin^2\frac{x}{2}} - \frac{1}{4}\cot\frac{x}{2} + C$

(10) $4 - \frac{\pi}{2}$

(11) ${}^{2013}\sqrt{2013!}$

(12) $y = (t-2)2^t + C$

(13) 27

(14) $f_Y(y) = \begin{cases} \frac{e^{-2\sqrt{y}}}{\sqrt{y}}, & y > 0, \\ 0, & y \leq 0 \end{cases}$

三、解答题

(15) $-\frac{5}{6}$

(16) 略

(17) $\frac{16}{9}(3\pi - 2)$

(18) (I) 在 $x_1 = 0.75, x_2 = 1.25$ 时, 利润达到最大值; (II) $x_1 = 0, x_2 = 1.5$, 利润最大

(19) (I) $a = \frac{1}{2}\ln 2$; (II) 在点 $(1, e^{-1})$ 处面积最大, $S_{\max} = \frac{2}{e}$

(20) $a = 1, b = 2, c = -2$; 通解为 $\begin{pmatrix} 1-k_1 & 2-k_2 & 1-k_3 \\ -k_1 & 2-k_2 & -1-k_3 \\ k_1 & k_2 & k_3 \end{pmatrix}$, k_1, k_2, k_3 为任意常数.

(21) (I) 特征值为 1, 1, 4; (II) 可相似对角化, 相似变换矩阵

$$P = (\alpha_1, \alpha_2, \alpha_3) \begin{pmatrix} -1 & -2 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{pmatrix} = (-\alpha_1 + \alpha_2, -2\alpha_2 + \alpha_3, \alpha_2 + \alpha_3), \quad \Lambda = \begin{pmatrix} 1 & & \\ & 1 & \\ & & 4 \end{pmatrix}$$

(22) (I) $f_U(u) = \begin{cases} \frac{2u}{9}, & 0 \leq u < 3, \\ 0, & \text{其他} \end{cases}$; (II) 3

$$(23) \quad (I) \quad f_{y|x}(y|x) = \frac{f(x,y)}{f_x(x)} = \begin{cases} \frac{1}{x}, & 0 < x < 1, 0 < y < x, \\ 0, & \text{其他} \end{cases}; \quad (II) \quad \frac{2}{11};$$

$$(III) \quad f_z(z) = \begin{cases} \frac{3}{2}(1-z^2), & 0 \leq z < 1, \\ 0, & \text{其他} \end{cases}$$

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