

Week 1: Basic Calculus Review

- 1.
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- MULTI
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- Single

Let A and B be sets. Which of the following statements is true?

- (a) $(A \cup B)^c = A \cup B^c$
- (b) $(A \cup B)^c = A^c \cup B^c$
- (c) $(A \cup B)^c = A^c \cap B$
- (d) $(A \cup B)^c = A^c \cap B^c$

- 2.
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For which x does $x^2 + x - 2 < 0$ hold?

- (a) $x \in [-4, 2]$
- (b) $x \in (-2, 1)$
- (c) $x \in \{-2, 1\}$
- (d) $x \in (-4, 2)$

- 3.
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Find the roots of the polynomial

$$p(x) = x^2 + 3x + 4$$

- (a) $x_1 = -\frac{5}{2} - i\frac{\sqrt{5}}{2}, x_2 = -\frac{5}{2} + i\frac{\sqrt{5}}{2}$
- (b) $x_1 = -\frac{3}{2} - i\frac{\sqrt{7}}{2}, x_2 = -\frac{3}{2} + i\frac{\sqrt{7}}{2}$
- (c) $x_1 = -\frac{3}{2} - i\frac{\sqrt{7}}{2}, x_2 = \frac{3}{2} - i\frac{\sqrt{7}}{2}$
- (d) $x_1 = -\frac{7}{2} - i\frac{\sqrt{7}}{2}, x_2 = -\frac{7}{2} + i\frac{\sqrt{7}}{2}$

- 4.
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Let $\binom{n}{k}$ be the binomial coefficient. Which of the following formulas is false?

- (a) $\sum_{k=0}^n \binom{n}{k} = 2^n$
- (b) $\binom{n}{k} = \binom{n}{n-k}$
- (c) $\binom{n}{k} = \binom{n-1}{k-1}$
- (d) $\binom{n}{0} = 1$

- 5.
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What is the coefficient of x^6 in the binomial expansion of $(1+x)^{10}$?

- (a) $\binom{10}{5}$.

- (b) $\binom{10}{4}$.
(c) $\binom{6}{10}$.
(d) 10.

6. MULTI Single

Let $f(x) = \frac{\cos x}{x}$. Which of the following statements is true?

- (a) The range of f is the interval $[-1, 1]$.
(b) f is bijective.
(c) The domain of f is $\{x \in \mathbb{R} : x \neq 0\}$.
(d) f is injective.

7. MULTI Single

Let $f : \mathbb{R} \rightarrow \mathbb{R}, x \mapsto x^5$. Which of the following statements is false?

- (a) f is bijective.
(b) f is surjective.
(c) f is injective.
(d) f is not invertible.

8. MULTI Single

Let $f : \mathbb{R} \rightarrow [-1, 1], x \mapsto \sin(x^2)$. Which of the following statements is false?

- (a) The domain of f is \mathbb{R} .
(b) f is surjective.
(c) f is injective.
(d) The range of f is $[-1, 1]$.

9. MULTI Single

Find the interpolating polynomial $P(x)$ going through the points $(1, 1)$, $(2, 2)$, and $(3, 7)$.

- (a) $P(x) = x^2 - 5x + 4$.
(b) $P(x) = 2x^2 - 4x + 5$.
(c) $P(x) = 2x^2 - 5x + 4$.
(d) $P(x) = x^2 - 4x + 4$.

10. MULTI Single

Find the zeros of the polynomial $P(x) = x^3 + 6x^2 + 5x - 12$.

- (a) 1, -4, -3.
(b) 1, 4, 3.
(c) 1, -4, 3.
(d) 1, 4, -3.

Total of marks: 10