

Module 0 review + self-test

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Practice problems

1. Find the limit: $\lim_{x \rightarrow -2} \frac{x^2+5x+6}{x+2}$
2. Solve the inequality $|3x + 1| > 7$ and write the answer in interval notation.
3. Let $f(x) = e^x$ and $g(x) = 2x - 5$. Find the expression for $(f \circ g)(x)$ and determine the value of $(f \circ g)(3)$.

Solutions

1. Find the limit: $\lim_{x \rightarrow -2} \frac{x^2+5x+6}{x+2}$
- Factorise the numerator: $x^2 + 5x + 6 = (x + 2)(x + 3)$
 - Rewrite the limit: $\lim_{x \rightarrow -2} \frac{(x+2)(x+3)}{x+2}$
 - Cancel the common factor $(x + 2)$ for $x \neq -2$: $\lim_{x \rightarrow -2} (x + 3)$
 - Substitute $x = -2$ into the simplified expression: $-2 + 3 = 1$

Answer: 1

2. Solve the inequality $|3x + 1| > 7$ and write the answer in interval notation.
- Split the absolute value into two cases: $3x + 1 > 7$ or $3x + 1 < -7$
 - Solve the first case: $3x > 6 \implies x > 2$
 - Solve the second case: $3x < -8 \implies x < -8/3$
 - Combine the results into interval notation: $(-\infty, -8/3) \cup (2, \infty)$

Answer: $(-\infty, -8/3) \cup (2, \infty)$

3. Let $f(x) = e^x$ and $g(x) = 2x - 5$. Find the expression for $(f \circ g)(x)$ and determine the value of $(f \circ g)(3)$.
- Substitute $g(x)$ into $f(x)$: $(f \circ g)(x) = f(2x - 5) = e^{2x-5}$
 - Substitute $x = 3$ into the composite function: $e^{2(3)-5}$
 - Simplify the exponent: $e^{6-5} = e^1$
 - The final value is e

Answer: e