Quotient rule

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. Differentiate $(3x+1)/(x+2)$. [2 marks]

The numerator is $3(x+2)-(3x+1)=5$.

Divide by $(x+2)^2$.

Answer: $5/(x+2)^2$, $x \neq -2$

2. Differentiate $(x^2-4)/x$ efficiently. [2 marks]

Rewrite as $x-4x^{-1}$.

Use the power rule.

Answer: $1+4/x^2$, $x \neq 0$

3. Find $f'(2)$ if $f(x)=x^2/(x+1)$. [2 marks]

The derivative is $[2x(x+1)-x^2]/(x+1)^2$.

Substitute 2 to obtain 8/9.

Answer: 8/9

4. Differentiate $e^x/(x+1)$. [2 marks]

The numerator is $e^x(x+1) - e^x = xe^x$.

Retain the excluded input.

Answer: $xe^x/(x+1)^2$, $x \neq -1$

5. Find the tangent to $y = (x+1)/(x-1)$ at $x = 0$. [3 marks]

The point is $(0, -1)$.

The derivative is $-2/(x-1)^2$, so its value is -2.

Use point-gradient form.

Answer: $y = -2x - 1$

6. Why is the derivative formula for $(x^2 - 1)/(x - 1)$ not valid at $x = 1$, even though cancellation gives $x + 1$ elsewhere? [3 marks]

Cancellation is valid only for $x \neq 1$.

A derivative at an input requires the original function to be defined there.

Answer: The original function is undefined at 1.