Using the Chain Rule

Learning Objectives

- Use the chain rule with the power rule
- Use the chain rule with the product and quotient rules

Use the chain rule with the power rule

1. Use the chain rule to find the derivative of $f(x) = (x^3 - x^2 - 9x + 1)^4$.

Use the chain rule with the product and quotient rules

2. Use the chain rule to find the derivative of $g(x) = e^x\sqrt{x^2 + 4}$.

3. Use the chain rule to find the derivative of $h(x) = \frac{e^x}{(x+7)^2}$.

- The Power Rule: $\frac{d}{dx}(x^n) = n\,x^{n-1}$
- The Product Rule: $\frac{d}{dx}(fg) = f'g + g'f$
- The Quotient Rule: $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - g'f}{g^2}$

ANSWER KEY

1. $f'(x) = 4(x^3 - x^2 - 9x + 1)^3(3x^2 - 2x - 9)$

2. $g'(x) = e^x\sqrt{x^2 + 4} + \frac{xe^x}{\sqrt{x^2+4}}$

3. $h'(x) = \frac{e^x(x+5)}{(x+7)^3}$