

Full name(s): _____ .

Questions

1. Compute the derivative of each of the following functions using the product rule:

- $f(x) = x^6 2e^x$
- $f(x) = \sqrt{x} 3^{3x}$
- $f(x) = (x^2 + 2x)\left(\frac{1}{2}\right)^x$

2. Compute the derivative of each of the following functions using the quotient rule:

- $f(x) = \frac{3^x + 1}{2^x - x}$
- $f(x) = \frac{x^2 + 2}{x^2 - 2}$
- $f(x) = \frac{x^3 3^x}{1 - x}$

3. Compute the derivative of each of the following functions using the chain rule:

- $f(x) = (x + e^x)^5$
- $f(x) = 2\sqrt{x+1}$
- $f(x) = \sqrt{e^{-x^2} + 1}$
- $f(x) = 2^{(3^{(4^x)})}$
- $f(x) = \sqrt{1 + \sqrt{1 + \sqrt{1 + x}}}$

4. Compute the following derivatives by any available means.

- $f(x) = x^3 \frac{2^x}{\sqrt{1+x}}$
- $f(x) = (10x^3 + 7x^2 + 5)^9$
- $f(x) = \left(\frac{1}{x-1} - \frac{1}{x+1}\right)^{14}$
- **Challenge.** $f(x) = x\sqrt{1 + x\sqrt{1 + x\sqrt{1 + x}}}$
- **Challenge.** $f(x) = \frac{1 - \frac{1}{\sqrt{x^2+1}}}{x^2 + 2x^2}$

5. What is equation for the tangent line of $f(x) = \frac{2^x}{x+1}$ at $x = 1$?