1. If the graph of \( f \) is as given below, draw the graph of \( f^{-1} \).

Soln: a) 

b) 

c) 

d)
2. If the graph of \( f' \) is given below, draw the graph of \( f \).

\[ \text{Graph of } f' \]

\[ \text{Graph of } f \]

**Soln:**

\[ \text{Graph of } f \]

\[ \text{Graph of } f' \]

3. Let \( f(x) = c \) (i.e. \( f(x) \) is a constant function). Find \( f'(x) \) using

a) The graph of \( f \)  

b) The limit definition of the derivative  

c) The power rule & constant

**Soln:**

\[ f \text{ looks like this. Any tangent line has slope zero, so } f(x) = 0. \]

\[ \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} \frac{c - c}{h} = \lim_{h \to 0} 0 = 0. \]

\( c) f(x) = c = c x^0 \) so \( f'(x) = \frac{d}{dx}(c x^0) = c \cdot \frac{d}{dx}(x^0) = c(0 \cdot x^{-1}) = 0. \)

4. Pretend you only know the derivative of constant functions & the product rule. (R2) Discover the constant multiple rule.

5. Find the derivative of \( \frac{2x^4 + 5x^3 + 4}{x^2} \) (hint: choose your strategy wisely)

**Soln:**

Easiest way: 
\[ \frac{2x^4 + 5x^3 + 4}{x^2} = 2x^2 + 5x + 4x^{-2} \]

\[ \frac{d}{dx}(2x^2 + 5x + 4x^{-2}) = 4x + 5 + (-2)4x^{-3} \]
\[ = 4x + 5x^{-3} - 8x^{-3} \]

Could also do quotient rule or product rule (with \((2x^4 + 5x^3 + 4)x^{-2}\)).
6. Find the derivative of $e^{x^{1/2}} \cdot e^{x + 1} x^3 + e^x$

Solution:
\[ e^{x^{1/2}} + 7e^{x + 1} x^3 + e^x = e^x \left( x^{1/2} + 7e^{x + 1} x^3 + 1 \right) \]
\[ \frac{d}{dx} \left( e^x \left( x^{1/2} + 7e^{x + 1} x^3 + 1 \right) \right) = e^x \left( x^{1/2} + 7e^{x + 1} x^3 + 1 \right) + e^x \left( \frac{1}{2} x^{-1/2} + 2xe^x \right) \] (using product rule)

7. Find the derivative of $x^{5/7} \quad (2x + 1)^2$.

Solution:
\[ x^{5/7} \quad (2x + 1)^2 = x^{5/7} \left( 4x^2 + 4x + 1 \right) \]
\[ = 4x^{14/7} + 4x^{12/7} + x^{5/7} \]
\[ \frac{d}{dx} \left( 4x^{14/7} + 4x^{12/7} + x^{5/7} \right) = 4 \cdot \frac{14}{7} x^{12/7} + 4 \cdot \frac{12}{7} x^{11/7} + 5 \cdot \frac{1}{7} x^{-2/7} \]

8. Find the derivative of $\frac{e^{x^{5/2} + x^2}}{(x+1)^2}$

Solution:
\[ \frac{d}{dx} \left( \frac{e^{x^{5/2} + x^2}}{(x+1)^2} \right) = \frac{\frac{d}{dx} \left( e^{x^{5/2} + x^2} \right) \cdot (x+1)^2 - e^{x^{5/2} + x^2} \cdot \frac{d}{dx} \left( (x+1)^2 \right)}{(x+1)^4} \]
\[ = \frac{\left[ e^{x^{5/2} + x^2} \cdot 5e^{x^{5/2} + x^2} \cdot 2x \right] \cdot (x+1)^2 - 2e^{x^{5/2} + x^2} \cdot (2x+2)}{(x+1)^4} \]
\[ = (x+1) \left[ e^{x^{5/2} + x^2} \cdot 5e^{x^{5/2} + x^2} \cdot 2x \right] \cdot (x+1)^2 - 2e^{x^{5/2} + x^2} \cdot (2x+2) \]
\[ = e^{x^{5/2} + x^2} \cdot 5e^{x^{5/2} + x^2} \cdot 2x \cdot (x+1)^2 - 2e^{x^{5/2} + x^2} \cdot (2x+2) \]
\[ = e^{x^6 + 4e^{x^{5/2} + x^2} \cdot 2x} \]