Nice Derivatives

1. Use the properties discussed in class to find the following:

\[
\frac{d}{dx} (x^7 - x^\pi + x^2 - 6.1) \quad \left(\frac{3}{4} x^8\right)'
\]

\[
\left(\left(\frac{1}{2} x\right)^5\right)' \quad \frac{d}{dx} \left(\frac{x^2 - 2\sqrt{x}}{x}\right)
\]

2. For what values of \(x\) does the graph of \(f(x) = x^4 - 6x^2 + 4\) have a horizontal tangent?
3. Consider \( \alpha(x) = x^4 + 2e^x \).

(a) Find the equation of the line tangent to the graph of \( \alpha \) at the point \((0, 2)\).

(b) Find the line normal to the line you found in part (a) that also passes through the point \((0, 2)\).

4. At what point on the curve of \( y = 1 + 2e^x - 3x \) is the tangent line parallel to the line \( 3x - y = 5 \)?

5. Find equations of both lines that are tangent to the curve \( y = 1 + x^3 \) and are parallel to the line \( 12x - y = 1 \).