Please show all of your work in answering the following:

1. Solve for $x$: $2x \frac{x^2}{\sqrt{x}} = \sqrt{x}$

2. Use rules of exponents to give the exact value of $8^{\frac{3}{4}}$.

3. Find an equation of the line that contains the points $(3,7)$ and $(-1,-5)$.

4. Sketch the function $f(x) = \begin{cases} x + 3 & x < 0 \\ 2 & x = 0 \\ x^2 + 4x + 3 & x > 0 \end{cases}$

5. Suppose that $5000 is invested at 8% compounded quarterly. How much money is in your account at the end of 3 years?

6. Compute the following limits:
   a) $\lim_{x \to -4} \frac{x^2 \cdot x \cdot 20}{x + 4}$
   b) $\lim_{x \to 0} \frac{x^2 \cdot x \cdot 20}{x + 4}$
   c) $\lim_{x \to 1} \frac{x^3 \cdot x + 1}{2x^3 + 7}$

7. Decide whether $f(x) = \frac{x^2 \cdot x + 20}{x + 4}$ is continuous at $x = 0$. Verify your answer.

8. Use the definition of derivative to find $f'(x)$ when $f(x) = x^2 \cdot 3x$

(OVER)
9. Find \( y \) when

\[
a) \quad y = 4x^5 \cdot x^2 + 2x^3 \\
b) \quad y = (x^2 \cdot 2x)(x^4 + 5x^2 + 3)^5 \\
c) \quad y = \frac{2x^2 \cdot 5x}{x^3 + 2} \\
d) \quad y = \frac{x}{x^2 - 1} \\
e) \quad y = x^2 \cdot \sqrt{5x} \\
f) \quad y = \frac{x^3 \cdot \sqrt{x}}{(x + 3)^4}
\]

10. Find \( y \) when \( y = \sqrt{2} \)

11. Find an equation of the line tangent to the curve \( y = \frac{4x}{1 + x^2} \) at the point \((0,0)\).

12. Given a distance function \( s(t) = t^3 \cdot t^{\frac{1}{3}} \). Find the velocity and the acceleration at \( t = 1 \).

13. Given a cost function \( C(x) = 1000\sqrt{x^3 + 2} \) and a revenue function \( R(x) = 2000\sqrt{x^3 + 3} \), find the marginal profit function.