1. (2 points) **Multiple Choice.** No work needed. No partial credit available. A particle moves with position function \( s(t) = t^3 - t^2 - 21t \). What is its velocity at the point where its acceleration is zero?

   A. \(-\frac{505}{27}\)
   
   B. \(-\frac{64}{3}\)
   
   C. \(\frac{2}{3}\)
   
   D. \(\frac{5}{27}\)
   
   E. None of the above.

2. (1 point) **Fill-in-the-Blank.** No work needed. No partial credit available.

   The following is the graph of the derivative \( f'(x) \) of a function \( f(x) \). Is the original function \( f(x) \) increasing or decreasing at \( x = 4 \)? **Decreasing**.

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**Extra Work Space.**

1. \( s(t) = t^3 - t^2 - 21t \)

   \[ v(t) = s'(t) = 3t^2 - 2t - 21 \]
   
   \[ a(t) = v'(t) = 6t - 2 \]

   \[ 0 = 6t - 2 \]

   \[ 2 = 6t \]

   \[ \frac{1}{3} = t \]

   \[ v\left(\frac{1}{3}\right) = 3\left(\frac{1}{3}\right) - 2\left(\frac{1}{3}\right) = 21 \]

   \[ = \frac{1}{3} \times \frac{2}{3} - \frac{63}{3} \]

   \[ = -\frac{64}{3} \]

Continue on to back side
3. (2 points) Find the tangent line to the curve \( \sqrt{2(x + y)} = 1 + x^2 y^2 \) at the point \((1, 1)\). Show your work.

Differentiate with respect to \( x \):

\[
\frac{2 \left(1 + \frac{dx}{dx}\right)}{2 \sqrt{2(x+y)}} = 0 + 2xy + x^2 (2y) \frac{dy}{dx}
\]

Plug in \((1, 1)\):

\[
\frac{\left(1 + \frac{dx}{dx}\right)}{\sqrt{2(2)}} = 2 + 2 \frac{dy}{dx}
\]

\[
\frac{1 + \frac{dx}{dx}}{2} = 2 + 2 \frac{dy}{dx}
\]

\[1 + \frac{dx}{dx} = 4 + 4 \frac{dy}{dx}
\]

\[-3 = 3 \frac{dy}{dx}
\]

\[-1 = \frac{dy}{dx}
\]

\[y = -x + 2\]