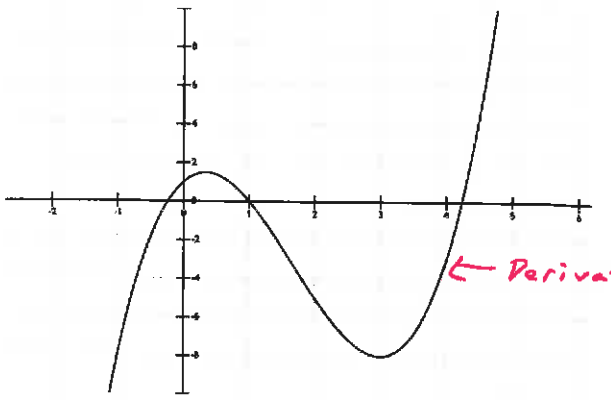
Name: _____

Clear your desk of everything excepts pens, pencils and erasers. If you have a question raise your hand and I will come to you.

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. $-\frac{565}{27}$
   B. $-\frac{64}{3}$
   C. $\frac{8}{3}$
   D. $\frac{8}{27}$
   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.



Extra Work Space.

① $s(t) = t^3 - t^2 - 21t$

$v(t) = s'(t) = 3t^2 - 2t - 21$

$a(t) = v'(t) = 6t - 2$

$0 = 6t - 2$

$2 = 6t$

$\frac{1}{3} = t$

$v(\frac{1}{3}) = 3(\frac{1}{9}) - 2(\frac{1}{3}) - 21$

$= \frac{1}{3} - \frac{2}{3} - \frac{63}{3}$

$= \frac{-64}{3}$

Continue on to back side

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

Differentiate with respect to x:

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

Plug in (1, 1):

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

$$\frac{1+\frac{dy}{dx}}{2} = 2 + 2\frac{dy}{dx}$$

$$1 + \frac{dy}{dx} = 4 + 4\frac{dy}{dx}$$

$$-3 = 3\frac{dy}{dx}$$

$$-1 = \frac{dy}{dx}$$

$$\boxed{y = -x + 2}$$

____ / 5