4. [10 points] For each of the following, give a *formula* for a single function satisfying <u>all</u> of the listed properties. If there is no function satisfying all the properties, circle NO SUCH FUNCTION EXISTS.

Note: If "NO SUCH FUNCTION EXISTS" is circled, then any formula you have written will <u>not</u> be graded.

a. [3 points] A *polynomial* $p(t)$ with the following three properties:
- The degree of $p(t)$ is three.
- $p(t) \to -\infty$ as $t \to \infty$.
- $p(0) = -4$.

Answer: $p(t) =$ _____ OR Circle: NO SUCH FUNCTION EXISTS

b. [3 points] An *exponential function* $q(v)$ with the following three properties:
- $q(1) = 3$.
- $\lim\limits_{v \to 0} q(v) = 12$.
- $\lim\limits_{v \to \infty} q(v) = 0$.

Answer: $q(v) =$ _____ OR Circle: NO SUCH FUNCTION EXISTS

c. [4 points] A *rational* function $r(x)$ with the following three properties:
- The line $x = 2$ is a vertical asymptote of the graph of $y = r(x)$.
- The line $y = -3$ is a horizontal asymptote of the graph of $y = r(x)$.
- $r(5) = 0$.

Answer: $r(x) =$ _____ OR Circle: NO SUCH FUNCTION EXISTS