1. Mark all answers that are correct. There may be more than one correct answer.

If the velocity of a car is $v(t)$, and $v$ is positive for all $t$, then the distance travelled between time $t=1$ and $t=2$ is:

a. $\int_1^2 v(t) \, dt$

b. $\int_1^2 v'(t) \, dt$

c. $F(2) - F(1)$, where $F$ is any antiderivative of $v(t)$.

d. $F(t) + C$, where $F$ is any antiderivative of $v(t)$.

e. $v(2) - v(1)$

f. The area between the graph of $v(t)$, the $t$-axis, and the lines $t=1$ and $t=2$.

2. Find all antiderivatives of $2^x \cdot x^2$.

3. Let $f(x) = e^x + x$ and $g(x)$ be the inverse function of $f$. Find the tangent slope of $g$ at the point $(1,0)$ on the graph of $g$.

4. Find the following limits algebraically:

a. $\lim_{x \to 2} \frac{x^2 - x - 2}{x - 2}$

b. $\lim_{x \to \infty} \frac{x^3 - 5x^4}{x^3 - 3x^4}$

5. Use implicit differentiation to find the tangent slope of the curve $xy + \ln(x-y) = 0$ at $(0,-1)$.

6. Let $f(x) = \begin{cases} \ln(x) & \text{if } x > 1 \\ x - 1 & \text{if } x \leq 1 \end{cases}$. Is $f$ continuous at $x=1$? Explain why or why not.

7. Find the derivative of $g(t) = \sqrt{\frac{1}{t^2 - 1}} + \ln 2$.

8. The rate of iron extraction from a mine is given by $q(t) = 45e^{-35t}$, where $t$ is years and $q(t)$ is tons of iron per year. Imagine that extraction continues forever. How much iron will be extracted?

9. Find the critical values, absolute extrema and inflection values of $f(x) = \ln(x^2 + 1)$.

10. A rectangular pasture of area 2 square miles is to be created next to a river. The other 3 sides need to be fenced off. Find the dimensions of the pasture that will minimize the length of fence needed.