

Name _____

- You have 20 minutes
- No calculators
- Show sufficient work

1. (2 points) At time t hours, a population of bacteria is growing at a rate of $20t + 50$ bacteria per hour. If the population is 2000 at time $t = 1$, then what is the population at time $t = 3$ hours?

2. (2 points) Evaluate the following definite integral. Simplify your answer.

$$\int_1^9 \frac{15\sqrt{x} - 6x^2}{3x} dx$$

3. (2 points each) Evaluate the following indefinite integrals.

(a) $\int \frac{x^4 + 2x^2 + 6}{x^2 + 1} dx$

(b) $\int \frac{\sin(2x)}{\sin(x) \cot(x)} dx$

4. (2 points) Suppose $p(x) = \int_5^{x^3} \tan(t^2) dt$. Find its second derivative $p''(x)$.