1. (20 points) A particle is moving such that its velocity, as a function of time, is given by
\[ v(t) = 6t^2 + 2t. \]
What is the particle’s average velocity between times 1 and 3?
A) 20 B) 30 C) 40 D) 50 E) 60

2. (30 points) Express the area between between the line \( y = x - 6 \) and the parabola \( y = x^2 - 4x \) as a definite integral of a polynomial. Clearly explain your reasoning for the integrand and the limits of the integral you write down. Don’t evaluate the integral. Your integral should not have any absolute values.
3. (15 points) Is the following statement true or false?
If \( f \) is any continuous function on \([a, b] \), then
\[
\int_a^b [f(x)]^2 \, dx = \left( \int_a^b f(x) \, dx \right)^2.
\]
True \quad False

4. (35 points) Evaluate the definite integral
\[
\int_0^{\ln(\frac{\pi}{3} + 1)} \left[ \sec(e^x - 1) \right] \left[ \tan(e^x - 1) \right] \left[ e^x \right] \, dx
\]
by using an appropriate substitution.