1. (1 point) Are you awake?

2. (8 points) Here is the graph of a function $y = f(x)$:

![Graph of a function](image)

Find $\int_{6}^{1} f(x) \, dx$.

3. (10 points) Find $\int_{0}^{4} \left( e^{-3q} - \frac{1}{1+q^2} \right) \, dq$.

4. (10 points) Find $\int q \sin(q) \, dq$.

5. (9 points) Calculate and simplify the Riemann sum to approximate $\int_{-1}^{5} (x^2 - 2x) \, dx$ using 3 equal length subintervals and left endpoints.

6. (10 points) Find $\int \frac{1}{r} \cos \left( 7 + 4 \ln(r) \right) \, dr$.

7. (12 points) Let $P$ be a function such that $P'(x) = \cos(x^3)$ for all real $x$. Find $\int 3xP(x) \, dx$ in terms of elementary functions and $P$.

8. (10 points) Your math tutor claims that

$$\int x^4 e^{-x} \, dx = -(24 + 24x + 12x^2 + 4x^3 + x^4)e^{-x} + C.$$  

Because this tutor has previously made mistakes, you are skeptical of this answer. Check whether this answer is right. Show your work.

9. (10 points) Define $h(y) = \int_{-10}^{2y} \sin(t^3 + 5t + 9) \, dt$. Find $h'(y)$. 


10. (10 points.) Find an antiderivative $F$ of the function $f(x) = 3x^2 - 6x + 5$ such that $F(2) = -1$.

11. (10 points.) Define

$$h(t) = \begin{cases} 6\sqrt{t} & 0 \leq t \leq 4 \\ \frac{20}{t^2} & t > 4 \end{cases}$$

Find $\int_{1}^{5} h(t) \, dt$.

EC. (20 extra credit points) Define

$$w(x) = \int_{3}^{x^2} \sin(e^{s}) \, ds - \cos(t^5) \, dt.$$ 

Find $w'(x)$. (There will be an integral sign in your answer.)