Name: _____

- You have fifty minutes to complete this mock exam.

1. Find a function f which satisfies the conditions $f'(x) = 3e^x + x$, and $f(0) = 4$.

2. A particle moves with velocity $v = 4 - t$. Find the total distance traveled by the particle after seven seconds.

3. Evaluate

$$\lim_{n\to\infty} \sum_{k=1}^{n} \frac{1}{n} \left(\left(\frac{k}{n} \right)^2 - 5 \left(\frac{k}{n} \right) \right).$$

4. Evaluate the following integrals.

(a) $\int_0^4 \left(\sqrt{x} + 3x\right)\ dx$

(b) $\int 4\frac{\sin\theta}{\cos^2\theta}\ d\theta$

(c) $\int_0^2 \frac{e^x}{1+e^{2x}}\ dx$

(d) $\int \frac{x+1}{(x^2+2x-1)^2}\ dx$

5. Find the area between the graphs of the curves $y = x^2$ and $y = 2 - x^2$ on the interval $0 \leq x \leq 2$.

6. (a) State the Mean Value Theorem.

(b) Prove that the equation

$$x^4 + 6x^2 - 1 = 0$$

has exactly two real solutions.

7. Let $\mathcal{R}$ be the region bounded by the curve $y = \sqrt{1 - x^2}$ and the x-axis.

   (a) Compute the volume of the solid obtained by rotating $\mathcal{R}$ about the x-axis.

   (b) Compute the volume of the solid obtained by rotating $\mathcal{R}$ about the line $x = -2$.

8. Find the average value of the function $f(x) = x^3 \cos x$ on the interval $[-\pi, \pi]$.