注意：必須把答題過程寫出來，請用微積分課上所學作答

1. Find $\lim_{x \to -\infty} (3x + 9)/(2x^2 + 1)^{1/2}$. 10%

2. Find a number a with the property that the line tangent to the graph of $f(x) = x^2$ at $(a, f(a))$ passes through $(-1, 0)$. 10%

3. An airplane, flying west at 400 miles per hour, goes over a certain town at 11:30 A.M., and a second plane at the same altitude, flying south at 500 miles per hour, goes over the town at noon. How fast are they separating at 1:00 P.M.? 10%

4. $\lim_{x \to 0} (4x^2 \cos 3x) / (\sin^2 3x)$. 10%

5. $D_x \int_{x^2}^{x^{1/2}} t \cos t^3 \, dt$. 10%

6. $\int (x^2 + 1)(x - 2)^{1/2} \, dx$. 10%

7. $\int_0^9 \frac{1}{(x - 2)^{1/3}} \, dx$. 10%

8. Find the volume of the solid generated by revolving the region bounded by $y = 2x^{1/2}$, $x = 4$, and $y = 0$ about $x = 4$. 10%

9. $\int \frac{x^4 + 3x^3 - 4x + 1}{x^3 + 4x^2 + 4x} \, dx$. 10%

10. Evaluate the iterated integral 10%

$$\int_0^1 \int_x^1 e^{y^2} \, dy \, dx.$$