計算題（請依題號順序答題）

1. Find $\lim\limits_{x \to 0} \dfrac{\sin(\pi x)}{\pi x}$. (10%)

2. Find the power series representation of $f(x) = e^x$. (10%)

3. Find the maximum value of $f(x) = x^3 - 7x^2 + 16x - 12$. (10%)

4. Let $f'(x) = 4x^3 - 12x^2$
   (a) Identify where the extrema of f occur. (5 %)
   (b) Find the intervals on which f is increasing and the intervals on which f is decreasing. (5 %)
   (c) Find where the graph of f is concave up and where is concave down. (5 %)

5. Find the tangent line and normal line to the ellipse $x^2 - xy + y^2 = 7$ at the point $(-1, 2)$. (10 %)

6. Find dy/dx for $y = x^x$, $x > 0$. (5 %)

7. Find the derivative of y; $y = \dfrac{\cos x}{1 - \sin x}$. (5 %)

8. Find $\int_0^1 x\sqrt{1 - x^2}\,dx$. (7 %)

9. Find $\int \dfrac{2x+1}{x+1}\,dx$. (7 %)

10. Find $\int xe^{2x}\,dx$. (7 %)

11. Find $\int_1^5 \int_0^z \int_2^x 2y\,dy\,dx\,dz$. (7%)

12. 試建立一積分式並以之求出由函數 $y = 3x - x^2$ 與 $y = x$ 所封閉之平面區域面積。(7%)