

P.O.C.A. WONG SIU CHING SECONDARY SCHOOL
PURE MATHEMATICS
CALCULUS : DERIVATIVES
ASSIGNMENT 16C

| Date | Name | Grade / Score |
|------|------|---------------|
| | | /15 |

1. Let $f(x) = \begin{cases} x^5 \cos \frac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$.

(a) Find $f'(x)$. (3 marks)

(b) Show that f is twice differentiable at 0. (2 marks)

(c) Is f'' continuous at 0? (3 marks)

2. Let $y = \tan^{-1} x$

(a) (i) Show that $(1 + x^2)y' = 1$. (1 mark)

(ii) Use the Leibniz formula to show that $(1 + x^2)y^{(n+1)} + 2nxy^{(n)} + n(n-1)y^{(n-1)} = 0$, for $n \geq 1$. (3 marks)

(b) Evaluate $y^{(n)}(0)$. (4 marks)