中原大學　107　學年度　■上學期 □下學期　考試命題紙 ■期中考

科目名稱: 微積分 (上)(3學分)
考試時間: 11 月 7 日第二節
* ⟨每題 7 分, 滿分 105 分⟩

1. Find equations of the tangent line and normal line to the curve $y = x + \sqrt{x}$ at the point $(1, 2)$.

2. Using the definition of derivative to evaluate the limit $\lim_{x\to 1} \frac{x^{1000}-1}{x-1}$.

3. Suppose that $f(5) = 1, f'(5) = 6, g(5) = -3$, and $g'(5) = -2$.
Find the following values (a) $(fg)'(5)$ (b) $\left(\frac{f}{g}\right)'(5)$ (c) $\left(\frac{g}{f}\right)'(5)$.

4. Using the definition of derivative to show that $\frac{d}{dx}(\sin x) = \cos x$.

5. Evaluate $\lim_{\theta\to 0} \frac{\cos\theta - 1}{2\theta^2}$.

6. Find the $99th$ derivative of $\sin x$.

7. Differentiate $y = \frac{(x-1)^4}{(x^2+2x)^5}$.

8. Differentiate $y = \sqrt{\sec x^3}$.

9. Let $r(x) = f(g(h(x)))$, where $h(1) = 2, g(2) = 3, h'(1) = 4, g'(2) = 5$, and $f'(3) = 6$.
Find $r'(1)$.

10. Find y' if $\sin(x+y) = y^2 \cos x$.

11. Find the linearization of the function $f(x) = \sqrt{x+3}$ at $a = 1$ and use it to approximate the number $\sqrt{3.98}$.

12. Use differentials to estimate the number $\sqrt[3]{1001}$.

13. Find y'' if $x^4 + y^4 = 16$.

14. Find the critical numbers of $f(x) = x^{\frac{4}{5}}(x-4)^2$.

15. Find the absolute maximum and absolute minimum values of the function $f(x) = x - \sqrt[3]{x}, -1 \le x \le 4$.

107 學年度第一學期理工電資學院微積分 (3學分) 期中考答案 2017.11.07

題號	答案	來源
1	the tangent line is $y-2=\frac{3}{2}(x-1)$, the normal line is $y-2=-\frac{2}{3}(x-1)$	2.3 – 習題 55
2	1000	2.3 – 習題 107
3	$(a)-20$ $(b)-\frac{16}{9}$ $(c)16$	2.3 – 習題 69*
4	略	2.4 – 例題
5	$-\frac{1}{4}$	2.4 – 習題 47
6	略	2.4 – 習題 51
7	$\frac{(x-1)^3(-6x^2+8x+10)}{(x^2+2x)^6}$	2.5 – 習題 26
8	$y'=\frac{1}{2\sqrt{\sec x^3}}\cdot\sec x^3\tan x^3\cdot 3x^2$	2.5 – 例題 8
9	120	2.5 – 習題 69
10	$y'=\frac{\cos(x+y)+y^2\sin x}{2y\cos x-\cos(x+y)}$	2.6 – 例題 3
11	1.995	2.6 – 例題 4
12	$\frac{3001}{300}$	2.9 – 習題 25
13	$\frac{-48x^2}{y^7}$	2.9 – 例題 1
14	the critical numbers are $0, 4, \frac{8}{7}$	3.1 – 習題 39
15	$f(4)=4-\sqrt[3]{4}$ is absolute max. value, $f((\frac{1}{3})^{\frac{3}{2}})=\frac{-2}{3}(\frac{1}{3})^{\frac{1}{2}}$ is absolute min. value	3.1 – 習題 53

* 爲非勾選習題、類似題.
證明題略過.