Philadelphia University

Department of Basic Sciences and Mathematics

First Semester

Calculus (1)	**2017/2018**	**Thursday, 25/1/2018**
0250101	**Final Exam**	**Time: 2 hours**

Name: ………………………………………….. **Student Number:** ……………………… **Section:** ………

Question One (2 points each): Write the symbol of the correct answer for each of the following questions. Only the answers in the table will be graded.

1	2	3	4	5	6	7	8	9	10	11	12	13	14

1) The **domain** of the function $f(x) = \log(x^2 - 5x + 6)$ equals

a) $(-\infty, -3) \cup (2, \infty)$

b) $(-\infty, -1) \cup (6, \infty)$

c) $(-\infty, -2) \cup (3, \infty)$

d) $(-\infty, 2) \cup (3, \infty)$

2) The exact value of $\tan\left(\sin^{-1}\left(\frac{4}{5}\right)\right)$ equals

a) $\frac{4}{3}$

b) $\frac{3}{5}$

c) $\frac{3}{4}$

d) $\frac{4}{5}$

3) If $f(x) = \tan^{-1}(x)$, then $f''(-3)$ equals

a) $-\frac{4}{25}$

b) $\frac{3}{50}$

c) $-\frac{3}{50}$

d) $\frac{4}{25}$

4) If $h(x)=f\left(g(x)\right)$, $h'(2)=12$, $g(2)=5$, and $f'(5)=3$, then $g'(2)$ equals

a) 3

b) 2

c) 1

d) 4

5) If $y=(x^2+1)^{\cos(3x)}$, then $\dfrac{dy}{dx}$ equals

a) $\dfrac{2x\cos(3x)}{x^2+1}-3\sin(3x)\ln(x^2+1)$

b) $[\dfrac{2x\sin(3x)}{x^2+1}+3\cos(3x)\ln(x^2+1)](x^2+1)^{\sin(3x)}$

c) $[\dfrac{2x\cos(3x)}{x^2+1}-3\sin(3x)\ln(x^2+1)](x^2+1)^{\cos(3x)}$

d) $\dfrac{2x\sin(3x)}{x^2+1}+3\cos(3x)\ln(x^2+1)$

6) If $f(x)=\cos(5x)$, then $f^{(41)}(x)$ equals

a) $-5^{41}\sin(5x)$

b) $-5^{41}\cos(5x)$

c) $5^{41}\sin(5x)$

d) $5^{41}\cos(5x)$

7) The equation of the tangent line of the curve of $x^2+y^2=20$ at the point $(x,y)=(4,-2)$ is

a) $y=2x+10$

b) $y=-2x-10$

c) $y=2x-10$

d) $y=-2x+10$

8) $\lim\limits_{x\to 2}\dfrac{\sqrt{x^2+5}-3}{x^2-4}$ equals

a) 8

b) $\dfrac{1}{8}$

c) 6

d) $\dfrac{1}{6}$

9) If $f(x)=\begin{cases} x^3+1, & x\le 1 \\ x^4+1, & x>1 \end{cases}$, then which of the following statements is **true** about $f(x)$

a) $f(x)$ is discontinuous and differentiable at $x=1$

b) $f(x)$ is continuous and differentiable at $x=1$

c) $f(x)$ is continuous and not differentiable at $x=1$

d) $f(x)$ is discontinuous and not differentiable at $x=1$

10) The function $f(x)=\ln(x-1)$ satisfies the conditions of the mean value theorem on $[2,e+1]$, then the value of c in the conclusion of the theorem is

a) $e-3$

b) e

c) $e+1$

d) $e-2$

11) $\int \frac{4\sec^2 x \tan x}{1+\sec^2 x}dx$ equals

a) $2\ln(1+\sec^2 x)+c$

b) $3\ln(1+\sec^2 x)+c$

c) $4\ln(1+\sec^2 x)+c$

d) $5\ln(1+\sec^2 x)+c$

12) If $\int_1^2 4f(x)dx=8$ and $\int_2^5 (f(x)-4)dx=-8$, then $\int_1^5 f(x)dx$ equals

a) 5

b) 6

c) 7

d) 8

13) $\int \frac{10\sin^{-1} x}{\sqrt{1-x^2}}dx$ equals

a) $3(\sin^{-1} x)^2+c$

b) $2(\sin^{-1} x)^2+c$

c) $4(\sin^{-1} x)^2+c$

d) $5(\sin^{-1} x)^2+c$

14) The area of the region enclosed by $f(x)=9x^2+1$, $x=1$, $x=3$ and the x-axis equals

a) 73

b) 80

c) 58

d) 62

Question Two (8 points): If $f(x) = x^3 - 12x$, $x \in [-5, 5]$, find (if any):

1) Critical values.
2) Increasing and decreasing intervals.
3) Maximum and minimum values and classify them as local (relative) or absolute.
4) Intervals of concavity, up or down.
5) Inflection points.

Question Three (3 points): Find $\lim_{x \to 0^+} (2x + 1)^{\cot x}$.

Question Four (3 points): Find $\int_1^e \frac{1}{x\left(1+\left(\ln x\right)^2\right)} dx$.

The End