Name&Surname: 01.12.20

No:

1	2	3	4	Sum
30p.	10p.	30p.	30p.	100

2020-2021 FALL MTH0141&MTH105 CALCULUS I MIDTERM EXAM

Q.1. (a)Find the domain of $h(x) = \ln\left(\dfrac{\lfloor x \rfloor - 1}{\log \lfloor x \rfloor}\right)$ ($\lfloor x \rfloor$ denotes the floor of x).

(b) Sketch the graph of $f(x) = |x - 1| + \dfrac{1}{2}|x + 2|$ and $g(x) = 2\ln(x - 1)$.

(c) In 1890, the population of İstanbul was 6250. If the population increased at a rate of 2.75% per year, estimate the population in 1915. With these assumptions when did the population reach 50 000? Evaluate it approximately.

Q. 2. Evaluate the following limits

$$(a)\quad \lim_{x \to -\infty}\left(\sqrt{9x^2 - x} - 3x\right) \qquad (b)\quad \lim_{x \to 0}\lfloor \sin x \rfloor \ \ (\text{floor of } \sin x)$$

Q. 3. (a) Explain why the equation $cos x = x$ has at least one solution.

(b) At which point does $f(x) = \dfrac{5^{1/x} + 3^{1/x}}{5^{1/x} - 3^{1/x}}$ fail to be continuous? Give reasons for your answer.

(c) Find the vertical and horizontal asymptotes of $y = \ln\left(\dfrac{x - 1}{x + 1}\right)$.

Q. 4. (a) Prove that $\dfrac{d}{dx}\left(\cos^{-1} x\right) = \dfrac{-1}{\sqrt{1 - x^2}}$, $|x| < 1$.

(b) If $f(0) = 2$, $\lim_{x \to 0}\dfrac{f(x) - 2}{x} = 3$ and $g(x) = e^{f(x)}\sin^2(\cos x)$, find $g'(0)$.

(c) Find the line that is tangent to the curve $x\sin 2y = y\cos 2x$ at the point $P\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$.

GOOD LUCK

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