IŞIK UNIVERSITY,   MATH 101 MIDTERM EXAM-II

Exam Duration: 1 hr. and 45 min.	Q1		Q2		Row No:
Last Name:		First Name:			Student ID:

Q.1. (10 pt) Use the graph of $y = f(x)$ given below to answer the questions that follow.

Answer all questions using only the points labeled on the graph above.

(a) At which point(s) is $f''(x) < 0$? _____

(b) At which point(s) does f change concavity? _____

(c) Where will f have a horizontal tangent line? _____

(d) At which point(s) is $f'(x) > 0$? _____

(e) At which point(s) is the product $(f(x) \cdot f'(x) \cdot f''(x)) < 0$? _____

Q.2 Find the following limits:

a. (9 pt) $\lim\limits_{x \to 0^+} \left(\dfrac{1}{e^{2x} - 1} - \dfrac{1}{x} \right)$

b. (9 pt) $\lim\limits_{x \to 2} (x - 1)^{\frac{1}{x-2}}$

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Exam Duration: 1 hr. and 45 min.	**Q3**		**Q4**		**Q5**		Row No:
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Q3. (10 pt) By using the implicit differentiation, find the equation of the tangent line to the curve $y = 2 + x - x^2 - \sin(xy)$ at the point $(0, 2)$. Do not use the formula $dy/dx = -F_x/F_y$.

Q4. (10 pt) Find the local and absolute extreme values of the function $f(x) = e^{-x^2}$ on the interval $[-1, 2]$.

Q5. (10 pt) Let $f(x) = x + \sin x$ be given on the interval $[\pi, 2\pi]$. Find the value or values of c whose existence is guaranteed by the Mean Value Theorem.

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Exam Duration: 1 hr. and 45 min.	**Q6**		**Q7**		**Q8**		Row No:
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Q6. (10 pt) Let $y' = x^2(x^2 - 8)$ be the first derivative of the function $y = f(x)$. Find the intervals where the function is concave up and concave down. Find the inflection points, if any.

Q7. (10 pt) By using limits, find the vertical, horizontal, and oblique asymptotes of the function $f(x) = \dfrac{x^2 + 3x + 2}{x^3 - 4x}$, if any.

Q8. (10 pt) Find the linearization of the function $f(x) = \sqrt[3]{x^2 + 4}$ at $x = 2$.

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Exam Duration: 1 hr. and 45 min.	**Q9**		Row No:
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Q9. Find the derivative of the following functions:

    a. (6 pt) $f(x) = \ln(\tan^{-1} x)$

    b. (6 pt) $f(x) = \dfrac{2^x(3x^2 - 1)}{\sqrt{x} + 1}$