

## IŞIK UNIVERSITY, MATH 103 MIDTERM EXAM-II

Exam Duration: 1 hr. and 15 min.	Q1		Q2		Row No:
Last Name:	First Name:			Student ID:	

**Q.1.** (16 pt) Let the function

$$f(x) = \begin{cases} x^3 + 1, & \text{if } x < -1 \\ x + 2, & \text{if } x \geq -1 \end{cases}$$

be given. Find the following limits:

a)  $\lim_{x \rightarrow -1^-} f(x)$

b)  $\lim_{x \rightarrow -1^+} f(x)$

b)  $\lim_{x \rightarrow -1} f(x)$

c)  $\lim_{x \rightarrow \infty} f(x)$

**Q.2.** (9 pt) Find the derivative of the function  $y = 2x^4 \sqrt{1 + x^3}$ .



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**Q3.** (15 pt) Find the following limits:

a)  $\lim_{x \rightarrow 2} \frac{3\sqrt{x+2} + \sqrt{x^2-4}}{2\sqrt[3]{x+6} - x}$

b)  $\lim_{x \rightarrow 3} \frac{2x-6}{x^2+2x-15}$

c)  $\lim_{x \rightarrow -\infty} \frac{3x^3}{5x-2x^2}$

**Q4.** (10 pt) Find the slope of the curve  $f(x) = \frac{x^2}{x+1}$  at  $x = 1$ . Then find an equation of the tangent line to this curve at  $x = 1$ .



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Q5. Let the function  $f(x) = \frac{2x + 6}{x^3 + x}$  be given.

a) (5 pt) Find the points of discontinuity.

b) (6 pt) Find the intervals where  $f(x)$  is continuous.

Q6. (12 pt) If  $y = 2u^3 + (u + 1)^2 + 1$  and  $u = \ln x$ , find  $\frac{dy}{dx}$  as a function of  $x$ .



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Exam Duration: 1 hr. and 15 min.	Q7		Q8		Q9		Row No:
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Q7. (7 pt) Is the function

$$f(x) = \begin{cases} x^2 + 2x, & \text{if } x \neq 1 \\ 4, & \text{if } x = 1 \end{cases}$$

continuous at  $x = 1$ ? Give reasons for your answer.

Q8. (12 pt) If  $y = (e^{3x} + 4)^2 + \ln(x^2 + 5)$ , find  $\frac{dy}{dx}$ .

Q9. (8 pt) Using the definition of derivative, find the derivative of  $f(x) = x^2 + x$ .

