

 YTU – Faculty of Chemical and Metallurgical Engineering, Questions and Answers Sheet	NOTE CHART										
	NUMBER OF TRUE ANSWERS						NUMBER OF WRONG ANSWERS			GRADE	
Student Name and Surname											
Students Number											
Section							Exam Date			19.01.2022	
Course Name	ANALYSIS I FINAL EXAM				Group Number		Exam Duration	90		Examination Room	
Course Instructor Name and Surname	Prof. Dr. İnci ALBAYRAK									Signature	
Student Disciplinary Regulations "and to make or attempt to make copies of exams to" the actual perpetrators are suspended from one or two semesters. (YÖK; 2547 Student Disciplinary Regulations, 9. Article)											

	A	B	C	D	E		A	B	C	D	E
1	0	0	0	0	0	11	0	0	0	0	0
2	0	0	0	0	0	12	0	0	0	0	0
3	0	0	0	0	0	13	0	0	0	0	0
4	0	0	0	0	0	14	0	0	0	0	0
5	0	0	0	0	0	15	0	0	0	0	0
6	0	0	0	0	0	16	0	0	0	0	0
7	0	0	0	0	0	17	0	0	0	0	0
8	0	0	0	0	0	18	0	0	0	0	0
9	0	0	0	0	0	19	0	0	0	0	0
10	0	0	0	0	0	20	0	0	0	0	0

Each question has 5 points.

SECTION-A

QUESTIONS (A)

<p>1) Evaluate the following limit, $\lim_{x \rightarrow 1} \frac{3x^2 - 2x - 1}{x^2 - x} = ?$</p> <p>A) 0 B) 1 C) 2 D) 3 E) 4</p>	<p>2) If $y = x \cdot \arccos x - \sqrt{1 - x^2}$, $y' = ?$</p> <p>A) $\arccos x$ B) $\arcsin x$ C) $\arccos x - \frac{1}{\sqrt{1-x^2}}$ D) $\arccos x + \frac{1}{\sqrt{1-x^2}}$ E) $\arccos x - \frac{x}{\sqrt{1-x^2}}$</p>
<p>3) If $y = \tanh(\ln x)$, $y' = ?$</p> <p>A) $\frac{\cosh^2(\ln x)}{x}$ B) $\frac{\operatorname{sech}^2(\ln x)}{x}$ C) $\frac{\cosh(\ln x)}{x}$ D) $\frac{\operatorname{sech}(\ln x)}{x}$ E) $\frac{\operatorname{coth}(\ln x)}{x}$</p>	<p>4) If $f(x) = x^5$, $(f^{-1})'(32) = ?$</p> <p>A) $\frac{1}{32}$ B) $\frac{1}{5}$ C) $\frac{1}{2}$ D) $\frac{1}{80}$ E) $\frac{1}{64}$</p>
<p>5) If $y = a^{2x}$, where a is a constant $y' = ?$</p> <p>A) $2 \ln a \cdot a^{2x}$ B) $2a^{2x} \ln a$ C) $2a^{2x-1}$ D) $\ln a \cdot \ln a^{2x}$ E) $\ln a^{2x}$</p>	<p>6) Let f is a differentiable function.</p> $\lim_{x \rightarrow 3} \frac{f(x) - f(3)}{x^2 - 9}$ <p>equals to</p> <p>A) $\frac{f'(3)}{3}$ B) $\frac{f'(3)}{4}$ C) $\frac{f'(3)}{6}$ D) $\frac{f'(3)}{8}$ E) $\frac{f'(3)}{9}$</p>

7)

$$\cot^2(x) \cdot \frac{d}{dx}(\tan^3(x))$$

is equivalent to

A) $3\cot(x)$ B) $-1 + \tan^2(x)$ C) $1 - \tan^2(x)$

D) $3\sec^2(x)$ E) $-3\sec^2(x)$

8)

$$y = \sqrt{u}$$

$$u = t^2 + 1$$

$$t = x^3 + 2x - 3$$

is given, find $\frac{dy}{dx}$ at $x = 0$.

A) $\frac{-11}{\sqrt{10}}$ B) $\frac{-6}{\sqrt{10}}$ C) 0 D) $\frac{3}{\sqrt{10}}$ E) $\frac{7}{\sqrt{10}}$

9) $f: \mathbb{R} \rightarrow \mathbb{R}$

$$f(x) = \frac{x^3}{3} - x^2$$

is given. What is the sum of a values satisfying $f'(a) \cdot f''(a) = 0$?

A) 0 B) 1 C) 2 D) 3 E) 4

10) $f: \mathbb{R}^+ \rightarrow \mathbb{R} - \{0\}$, $y = f(x)$

$$\sqrt{x} + \sqrt{y} = x^2 + y^2$$

is given. Find the value of $f'(1)$.

A) 1 B) $\frac{1}{2}$ C) 0 D) $-\frac{1}{2}$ E) -1

11) Using differentials, estimate

$$\sin\left(\frac{\pi}{3} + 0.02\right) - \sin\left(\frac{\pi}{3}\right).$$

A) $\frac{\sqrt{3}}{100}$ B) $\frac{\sqrt{3}}{200}$ C) $\frac{1}{100}$ D) $\frac{2}{100}$ E) 0

12) Using a linear approximation, compute $\sqrt[4]{16.02}$.

A) $2 + \frac{1}{3200}$ B) $1 + \frac{1}{1600}$ C) $\frac{1}{1600}$

D) $\frac{1}{3200}$ E) $2 + \frac{1}{1600}$

13) Suppose that $f(0) = -7$ and $f'(x) \leq 12$ for all values of x . How large $f(3)$ possibly be?

- A) 36 B) 29 C) 30 D) 0 E) -29

14) Evaluate the following limit

$$\lim_{x \rightarrow 0^+} (\sin^{-1}(x))^x = ?$$

- A) 1 B) -1 C) 0 D) 2 E) -2

15) Evaluate the following limit

$$\lim_{x \rightarrow \infty} \left(\frac{x-4}{x+1} \right)^{\frac{x}{3}} = ?$$

- A) e^{-1} B) $e^{-\frac{5}{3}}$ C) $e^{\frac{5}{3}}$ D) $e^{\frac{3}{5}}$ E) 0

16) Which point on the graph of $y = 4 - x^2$ is closest to the point $(0, 2)$ in the first quadrant?

- A) $(0, 4)$ B) $(\sqrt{3/2}, 5/2)$ C) $(\sqrt{2}, 2)$
D) $(\sqrt{1/2}, 7/2)$ E) $(2, 0)$

17) Consider the function $f(x) = \frac{x^3}{x^2 - 2x}$. Which of the following statement(s) is (are) true?

- I. $f(x)$ has a vertical asymptote of $x = 2$.
- II. $f(x)$ has a vertical asymptote of $x = 0$.
- III. $f(x)$ has an oblique asymptote of $y = x + 2$.

- A) None B) I only C) I and II only
D) I and III only E) I, II and III

18) Select the **FALSE** statement associated with the function $f(x) = \frac{x^2}{x-1}$.

- A) f is increasing on $(-\infty, 0) \cup (2, \infty)$.
- B) f is decreasing on $(0, 1) \cup (1, 2)$.
- C) f is concave up on $(1, \infty)$.
- D) f is concave down on $(-\infty, 1)$.
- E) The graph of the function has one point of inflection and two relative extrema.

19) Find the rectangular coordinates of the point **P** whose polar coordinates are $(r, \theta) = (-6, \frac{5\pi}{3})$.

- A) $(-3, \sqrt{3})$ B) $(-3, 3\sqrt{3})$ C) $(-3, 2\sqrt{3})$
D) $(-3, -3\sqrt{3})$ E) $(-3, -\sqrt{3})$

20) Find the points on the cardioid $r = 1 - \cos\theta$ at which there is a horizontal tangent line.

- A) $(\frac{3}{2}, \frac{2\rho}{3})$ and $(\frac{3}{2}, \frac{4\rho}{3})$
B) $(2, \rho)$ and $(\frac{1}{2}, \frac{\rho}{3})$
C) $(2, \rho)$ and $(\frac{1}{2}, \frac{5\rho}{3})$
D) $(2, \rho)$ and $(0, 0)$
E) $(1, \frac{\rho}{2})$ and $(0, 0)$