Part I：Choices. Select only ONE answer choice from a list of four choices.

1. Assume $f(x) = \begin{cases} \frac{2x^2-18}{3-x}, & x \neq 3 \\ 1, & x = 3 \end{cases}$. What is the value of $\lim_{x\to 3} f(x) = ?$?

Ⓐ -12 Ⓑ -15 Ⓒ -18 Ⓓ does not exist.

Ans: Ⓐ

2. Assume $\lim_{x\to\infty} \frac{ax^2-bx+1}{2x+5} = -5$. What is the value of $a+b$?

Ⓐ 0 Ⓑ 5 Ⓒ 10 Ⓓ 20.

Ans: Ⓒ

3. Which one of the following statements is correct?

Ⓐ If f is polynomial then $\lim_{x\to a} f(x) = f(a)$.

Ⓑ If $f(a)$ is undefined then $\lim_{x\to a} f(x)$ does not exist.

Ⓒ If $\lim_{x\to a^-} f(x) = \lim_{x\to a^+} f(x)$ then f is continuous at $x = a$.

Ⓓ If $f+g$ is continuous then both f and g are continuous.

Ans: Ⓐ

4. Assume $f(x) = x^2 - 2x + 1$ is defined on the closed interval $[-2,1]$. Find the value of c that satisfies the mean value theorem for derivatives of the function.

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

Ans: Ⓐ

5. Where is $f(x) = \frac{1}{3}x^3 - x^2 - 3x + 4$ decreasing?

Ⓐ $(-\infty,-1)$ Ⓑ $[-1,1]$ Ⓒ $[1,\infty)$ Ⓓ $[-1,3]$.

Ans: Ⓓ

6. Find the relative maxima and relative minima, if any, of the function $g(x) = \dfrac{x+9}{x}$

Ⓐ Relative maximum: g(0) = - 9; No relative minima

Ⓑ Relative maximum: g(9) = 0; Relative minimum g(0) = - 9

Ⓒ No relative maxima; Relative minima g(0) = - 9

Ⓓ No relative maxima or minima

Ans: Ⓓ

7. Let $f(x) = \left|\frac{x}{x-1}\right|$. Find $f'(0.5)$

Ⓐ 0 Ⓑ 0.5 Ⓒ 0.25 Ⓓ 4

Ans: Ⓓ

8. The function $y = 1 + \dfrac{1}{x} - \dfrac{2}{x^3}$ has

Ⓐ local minimum at $x = \sqrt{6}$, inflection at $x = 2\sqrt{3}$.

Ⓑ local minimum at $x = -\sqrt{6}$, local maximum at $x = \sqrt{6}$, inflection at $x = \pm\sqrt{3}$

Ⓒ local minimum at $x = \sqrt{6}$, local maximum at $x = -\sqrt{6}$, inflection at $x = \pm 2\sqrt{3}$

Ⓓ local minimum at $x = -\sqrt{6}$, local maximum at $x = \sqrt{6}$, inflection at $x = \pm 2\sqrt{3}$

Ans: Ⓓ

9. The polynomial $P(x) = x^3 - x - 5$ surely has a root in the following interval

Ⓐ $(3, 4)$ Ⓑ $(1, 2)$ Ⓒ $(0, 1)$ Ⓓ $(-1, 1)$

Ans: Ⓑ

10. Let $f(x)$ be the following function $f(x) = \begin{cases} -1 & x \le 0 \\ 1 & x > 0 \end{cases}$. The function $f(x) + g(x)$ is continuous for the following function g.

Ⓐ $g(x) = 2$ if $x \ne 0$, $g(0) = 0$.

Ⓑ $g(x) = 0$ if $x \ne 0$, $g(0) = 2$.

Ⓒ $g(x)=2$ if $x \le 0$, $g(x)=0$ if $x > 0$.

Ⓓ $g(x)=2$ if $x < 0$, $g(x)=0$ if $x \ge 0$.

Ans: Ⓒ

Part II：Fill in the Blanks.

(a) Let $f(x)=\begin{cases} 3x^2-7, & x \le 2 \\ 2x+a, & x > 2 \end{cases}$. If $f(x)$ is continuous at $x=2$, find a.

______①______ .

Ans: 1

(b) Let $y=3\cos(2x)$. Find $\frac{d^{10}}{dx^{10}}y(0)$. ___②③ × ④^⑤⑥___ .

Ans: $-3 \cdot 2^{10}$

(c) Assume $y=ax+b$ is the equation of the tangent line of $x^3y+xy^3=30$ at $(1,3)$. What is the value of b?.

$\frac{⑦⑧}{⑨}$

Ans: $\frac{30}{7}$

(d) Calculate the limit $\lim_{x\to-\infty}\frac{2x-1}{\sqrt[3]{x^3+1}}$. ______⑩______.

Ans: 2