BC Calculus
Chapter 9
Review

No Calculator!

1) Write an explicit formula for the sequence $\frac{2}{4}, \frac{3}{7}, \frac{4}{12}, \frac{5}{19}, \frac{6}{42}, \ldots$. Then find a_{14}.

A $a_n = a_{n-1} - \frac{n-1}{7n}; \frac{15}{199}$

B $a_n = \frac{a_{n+1}}{n^2+3}; \frac{15}{199}$

C $a_n = \frac{n+1}{n^2+3}; \frac{15}{199}$

D $a_n = \frac{n}{n^3-1}; \frac{14}{2743}$

2) Write the explicit formula for the sequence. Then find the fifth term in the sequence: $a_1 = 3, r = -3$.

A $a_n = 3 \cdot (-3)^{n-1}; 243$

B $a_n = -3 \cdot (3)^{n-1}; -243$

C $a_n = 3 \cdot (3)^n; 243$

D $a_n = 3 \cdot (-3)^n; -729$

3) Determine whether the sequence defined by

$$a_n = n^2 \cos\left(\frac{2}{n^2} + \frac{\pi}{2}\right)$$

converges or diverges. If it converges, find its limit.

a. -2

b. -1

c. 0

d. π

e. Diverges

4) The sequence $a_n = \sin\frac{n\pi}{6}$

(A) is unbounded ~~**(B)** is monotonic~~
(C) converges to a number less than 1 **(D)** is bounded
(E) diverges to infinity

5) If $s_n = \left(\frac{(5+n)^{100}}{5^{n+1}}\right)\left(\frac{5^n}{(4+n)^{100}}\right)$, to what number does the sequence $\{s_n\}$ converge? 1993 BC 31 Calc

(A) $\frac{1}{5}$ (B) 1 (C) $\frac{5}{4}$ (D) $\left(\frac{5}{4}\right)^{100}$ (E) The sequence does not converge.

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6) If k is a positive integer, then $\lim_{x\to+\infty}\frac{x^k}{e^x}$ is 1988 BC 35

(A) 0 (B) 1 (C) e (D) $k!$ (E) nonexistent

7) Show which function, $\ln x$ or $\log_2 x$ grows faster.

*will be one on the test and will NOT be multiple choice

8) $\lim_{x\to 0^+} \frac{\cot x}{\ln x} =$

(A) $-\infty$ **(B)** -1 **(C)** 0 **(D)** 1 **(E)** ∞

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9) $\lim_{x\to 0} \frac{1-\cos^2(2x)}{x^2} =$

1973 BC 37

(A) -2 (B) 0 (C) 1 (D) 2 (E) 4

10) $\lim_{x\to\frac{\pi}{4}} \dfrac{\sin\left(x-\frac{\pi}{4}\right)}{x-\frac{\pi}{4}}$ is

1985 BC 29

(A) 0 (B) $\dfrac{1}{\sqrt{2}}$ (C) $\dfrac{\pi}{4}$ (D) 1 (E) nonexistent

11) $\lim_{x\to 0} \dfrac{\tan 3x}{2x} =$

(A) 0 (B) $\dfrac{1}{2}$ (C) $\dfrac{2}{3}$ (D) $\dfrac{3}{2}$ (E) ∞

12) $\lim_{x\to 1} \dfrac{\int_1^x e^{t^2}\,dt}{x^2-1}$ is

1998 BC 28

(A) 0 (B) 1 (C) $\dfrac{e}{2}$ (D) e (E) nonexistent

13) $\int_0^{\infty} xe^{x^2} dx$

a. 0

c. $\frac{1}{2}$

b. Divergent

b. $-\frac{1}{2}$

d. 1

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14) $\int_2^{+\infty} \frac{dx}{x^2}$ is

1988 BC 7

(A) $\frac{1}{2}$ (B) ln 2 (C) 1 (D) 2 (E) nonexistent

15) Which of the following improper integrals diverges?

(A) $\int_0^{\infty} e^{-x^2} dx$ **(B)** $\int_{-\infty}^{0} e^{x} dx$ **(C)** $\int_0^1 \frac{dx}{x}$

(D) $\int_0^{\infty} e^{-x} dx$ **(E)** $\int_0^1 \frac{dx}{\sqrt{x}}$

16) $\int_{-\infty}^{\infty} \frac{2}{1+x^2} dx$

a. 0

b. 2π

c. $\frac{\pi}{2}$

b. π

c. Divergent