

Math 132, Final Exam, May 3rd

3.30 - 5.30

All questions carry equal marks. Choose the answer that is closest to the solution (remember this means rounding the number, not just truncating it).

Trigonometric identities

$$\sin^2(x) = \frac{1}{2}[1 - \cos(2x)]$$

$$\cos^2(x) = \frac{1}{2}[1 + \cos(2x)]$$

$$\sin(x + y) = \sin(x) \cos(y) + \cos(x) \sin(y)$$

$$\cos(x + y) = \cos(x) \cos(y) - \sin(x) \sin(y)$$

$$\sin(x) \sin(y) = \frac{1}{2}[\cos(x - y) - \cos(x + y)]$$

$$\cos(x) \cos(y) = \frac{1}{2}[\cos(x - y) + \cos(x + y)]$$

$$\sin(x) \cos(y) = \frac{1}{2}[\sin(x - y) + \sin(x + y)]$$

$$\int \sec(x) dx = \ln |\sec(x) + \tan(x)| + C$$

$$\int \tan(x) dx = \ln |\sec(x)| + C$$

1. Consider the statements:

(I) A necessary condition for $\sum_{n=1}^{\infty} a_n$ to converge is that $\lim_{n \rightarrow \infty} a_n = 0$.

(II) A sufficient condition for $\sum_{n=1}^{\infty} a_n$ to converge is that $\lim_{n \rightarrow \infty} a_n = 0$.

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F

A. Both I and II are true.

B. I is true, II is false.

C. II is true, I is false.

D. Both I and II are false.

2. The first term of a sequence is $x_1 = 1$. For $n > 1$,

$$x_n = \sum_{k=1}^{n-1} x_k.$$

What is $\ln(x_{1000})$?

- A. 690
- B. 691
- C. 692
- D. 693
- E. 694
- F. 695
- G. 696
- H. 697
- I. 698
- J. 699

$$x_1 = 1$$

$$x_2 = 1$$

$$x_3 = 1 + 1 = 2$$

$$x_4 = 2 + 1 + 1 = 4$$

$$x_5 = 4 + 2 + 1 + 1 = 8$$

⋮

$$x_n = 2^{n-2}$$

$$\ln(x_{1000}) = \ln(2^{998})$$

$$= 998 \ln 2$$

$$= 691.76$$