

Mathematical Skills

Miscellaneous Topics

Legend: After marking, ✓ indicates a correct response, while ✗ indicates incorrect; in this case, the correct answer is marked with ●.



Instructions

- first click on “begin quiz” at **the start**; after a few seconds the quiz will be redrawn and ready to use;
- then answer each of the questions.
- finally, click on “end quiz” at the end.

If you are still connected to the Internet, your attempt will be sent electronically for recording. Solutions will then become accessible for printing and study.

- Passing the cursor over an incorrect answer choice will display a hint. This is only available after the quiz is completed.

You should be able to score 100%. If not, study the solutions provided and try to understand why your own answer was incorrect.

Attempt the quiz again. If you still have difficulties, then seek help to better understand those questions that were answered incorrectly. Only then should you repeat the quiz.

Printing hint: To avoid excessive paper usage, choose settings: A4, 2-up (i.e. 2 frames on each printed page), print double-sided if your printer allows.



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Miscellaneous Topics

1. Find all solutions of the congruence $402x \equiv 108 \pmod{930}$ where $0 \leq x \leq 930$, using the extended Euclidean Algorithm.
(Eg. if $x = 24 + 5n$, $n = 0, 1, \dots, 6$, type $24+5n$, $n=0, \dots, 6$)

$$x =$$

Solution

Answer:

2. Evaluate the following: (example syntax: for $\frac{1}{\sqrt{2}}$ type $1/\text{sqrt}(2)$, if the answer is undefined, type **undefined**).

$$\sin\left(\frac{5\pi}{3}\right) =$$

Solution

Answer:



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3. Evaluate ${}^{11}P_2$.

$${}^{11}P_2 =$$

Solution

Answer:

4. Given $f(x) = x(x + 8)$, find $f(x + 4)$.

Solution

$$(x + 4)(x + 12)$$

$$x^2 + 8x + 4$$

$$x(x + 12)$$

none of these

5. For what values of x is $|14x + 9| < 19$?

Solution

$$x < \frac{5}{7}$$

$$-2 < x < \frac{5}{7}$$

$$x < -2, x > \frac{5}{7}$$

none of these.



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6. Given $f(x) = x^3 \sin x$, what is its derivative, $f'(x)$?

Solution

$$3x^2 \sin x$$

$$x^3 \cos x$$

none of these.

$$x^2 (3 \sin x + x \cos x)$$

$$3x^2 \cos x$$

7. Find $\int 8 \sec^2(5x) \tan^8(5x) dx$ using an appropriate substitution.

(Example syntax: for $\sin^2(3x)$ type $(\sin(3*x))^2$, you need not include the constant of integration.)

$$\int 8 \sec^2(5x) \tan^8(5x) dx =$$

Solution

Answer:



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8. Let $A = \{b, c, e, f, h\}$, $B = \{a, d, e, h\}$ and $C = \{e, f, g\}$. List the elements of the set $A \cup (B \setminus C)$.

(eg.: if $S = \{a, b, c\}$ type **a,b,c**, if S is empty, type **empty**)

$$A \cup (B \setminus C) =$$

Solution

Answer:

9. Select the string which belongs to the regular language $(0^+ + 1101)^+ 1001(110^* + 0100)^+$

Solution

10001001110000

11011001100

11010001110000

00001001110000

none of these.



10. Determine if the expression $q \rightarrow ((p \vee (((p \rightarrow r) \rightarrow p) \wedge q)) \vee q)$ is a tautology (always true), a contradiction (always false) or neither.

Solution

Tautology

Contradiction

Neither



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Solutions

Solution to Question 1



Attempt the quiz before trying to look at solutions.

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◀◀	▶▶
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Solution to Question 2



Attempt the quiz before trying to look at solutions.

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Solution to Question 3



Attempt the quiz before trying to look at solutions.



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Solution to Question 4

Attempt the quiz before trying to look at solutions.



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Solution to Question 5



Attempt the quiz before trying to look at solutions.

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Solution to Question 6



Attempt the quiz before trying to look at solutions.

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Solution to Question 7



Attempt the quiz before trying to look at solutions.

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Solution to Question 8



Attempt the quiz before trying to look at solutions.



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Solution to Question 9



Attempt the quiz before trying to look at solutions.

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Solution to Question 10



Attempt the quiz before trying to look at solutions.

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◀◀	▶▶
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