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6. Practice with slicing surfaces

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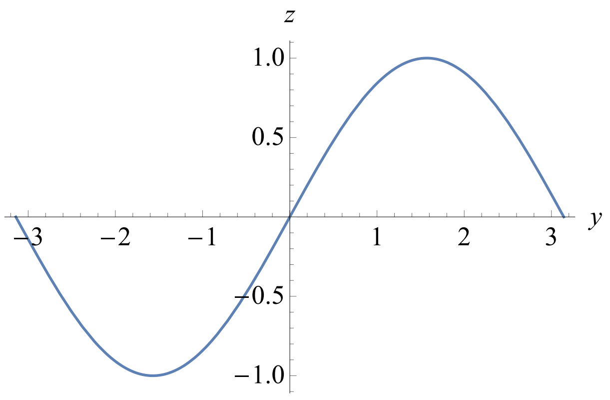
Lecture due Aug 4, 2021 20:30 IST Completed

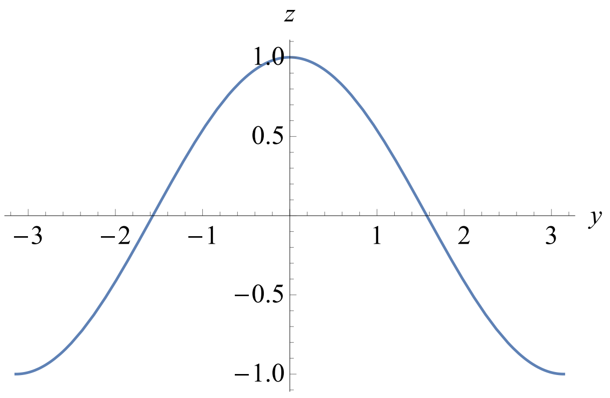
Practice

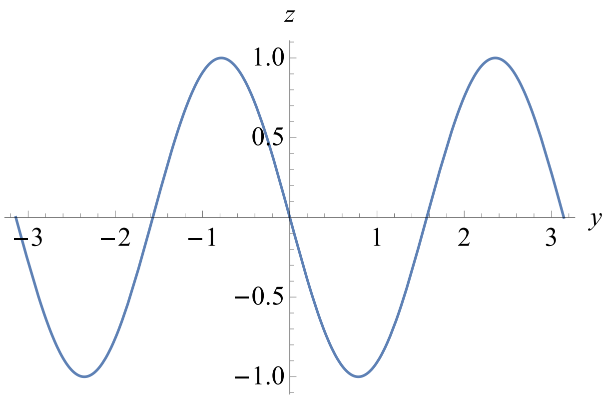
Identify the slice 1

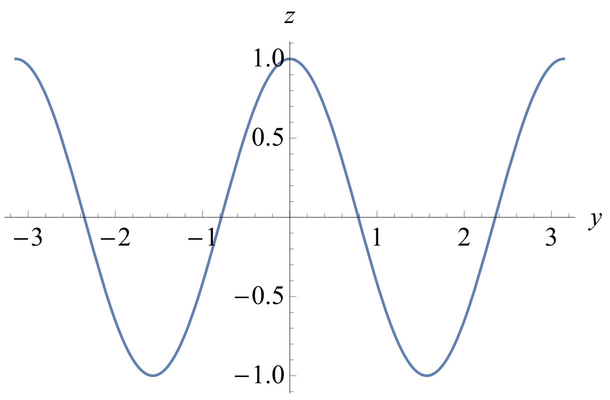
1/1 point (graded)

Which of the following curves shows the intersection of the yz-plane with the function $z = \sin(x - 2y)$?









None of the above

Solution:

The intersection is given by setting $x = 0$ in the equation $z = \sin(x - 2y)$, which gives $z = \sin(-2y) = -\sin(2y)$. Thus we get a sinusoidal function that is negative, and has period π.

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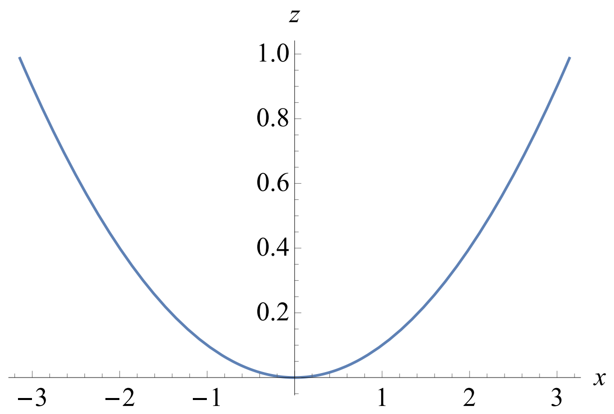
Submit You have used 1 of 2 attempts

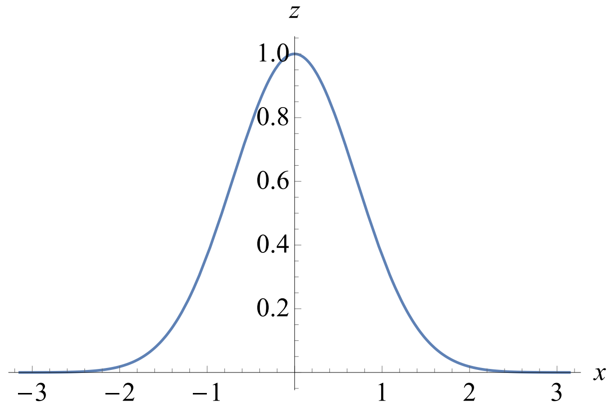
Answers are displayed within the problem

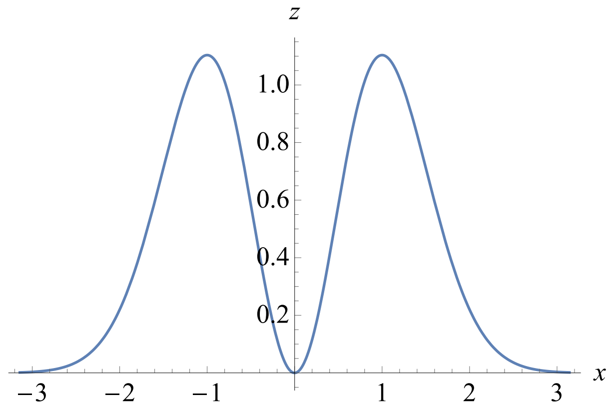
Identify the slice 2

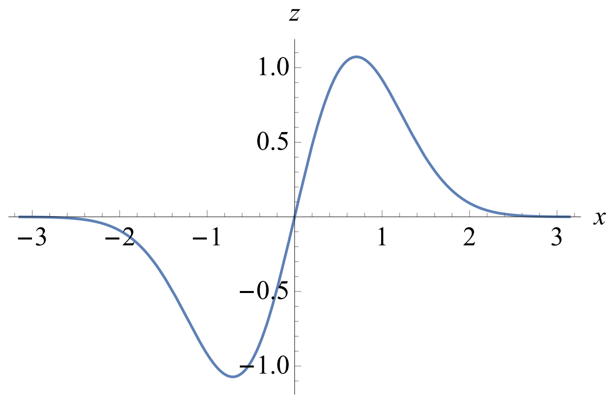
1/1 point (graded)

Which of the following curves shows the intersection of the xz-plane with the function $z = 3\left(x^2 + y\right)e^{-\left(x^2+y^2\right)}$
?









None of the above

Solution:

The intersection is obtained by setting $y = 0$ in the equation for z, which gives

$$z = 3x^2 e^{-x^2}$$

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To analyze what this function looks like, we note that it tends towards 0 for very large positive or negative values of x. We need to understand how many local maxima and minima it has to better understand its shape.

One way to do this is to note that it is 0 at 0, it is always positive. (In particular it is an even function, meaning it is symmetric about $x = 0$.) Therefore it has one minimum at 0, and must have 2 maxima.

Another way to analyze the shape is to take the derivative, identify critical points, and then analyze the critical points directly using the first or second derivative test from single variable calculus.

Submit You have used 1 of 2 attempts

Answers are displayed within the problem

Identify the graph

1/1 point (graded)

The following planar graphs show the intersection of the yz-plane, xz-plane, and xy-plane with the surface $z = f(x, y)$. Which of the following functions could be $f(x, y)$?

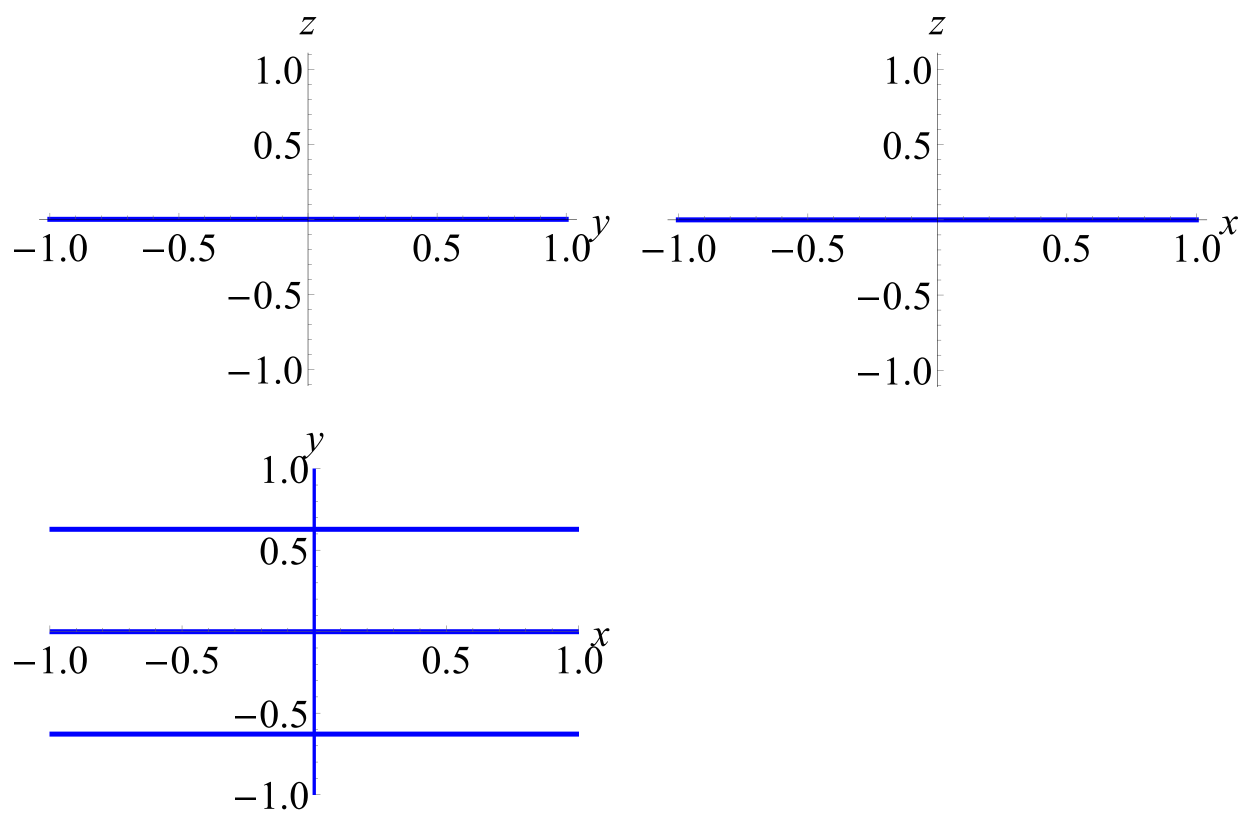
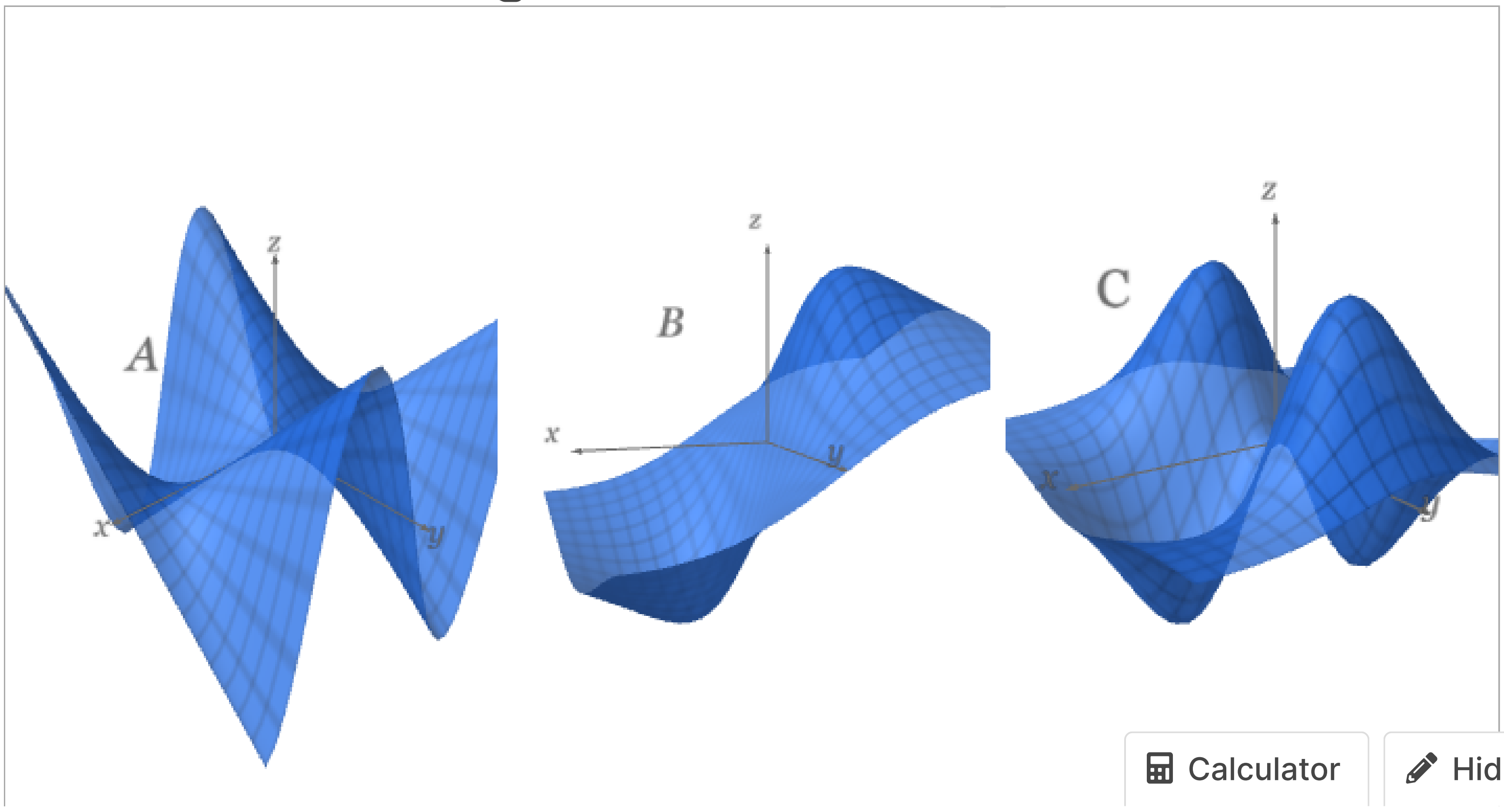


Figure 10: First image: the yz-plane slice. Second image: the xz-plane slice. Third image: the xy-plane slice.

▸ Options for Multiple Choice



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- A
- B
- C
- None of the above ✔

✖

Solution:

We can eliminate options B and C do not have slices by the xz-plane that give a horizontal line.

We check option A and see that both the yz and xz slices are correct! However, the xy slice is not quite right! The slice we were given has level curves along parallel lines in the y-direction, while the graph in option A has parallel lines in the x direction.

Therefore the answer is none of the above.

Submit You have used 0 of 3 attempts

Answers are displayed within the problem

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