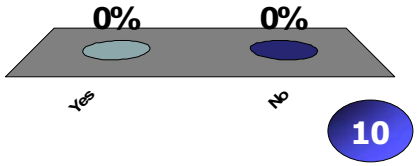
Fourier Series and Transforms

Clicker questions

Does the Fourier series of the function f converge at $x = 0$?

$$f(x) = \begin{cases} \dfrac{-\pi}{4} & \text{if } -\pi < x \le 0 \\ \dfrac{\pi}{4} & \text{if } 0 < x \le \pi \end{cases}$$

✔1. Yes
2. No



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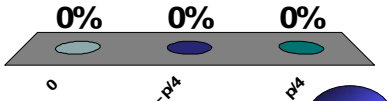
To what value does the Fourier series of the function f converge at $x = 0$?

$$f(x) = \begin{cases} \dfrac{-\pi}{4} & \text{if } -\pi < x \le 0 \\ \dfrac{\pi}{4} & \text{if } 0 < x \le \pi \end{cases}$$

✔1. 0
2. $-\pi/4$
3. $\pi/4$



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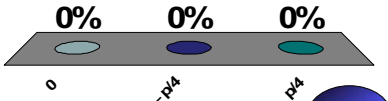
To what value does the Fourier series of the function f converge at $x = 1$?

$$f(x) = \begin{cases} \dfrac{-\pi}{4} & \text{if } -\pi < x \le 0 \\ \dfrac{\pi}{4} & \text{if } 0 < x \le \pi \end{cases}$$

1. 0
2. $-\pi/4$
✔3. $\pi/4$



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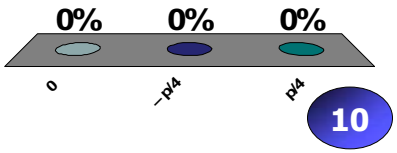
To what value does the Fourier series of the function f converge at $x = \pi$?

$$f(x) = \begin{cases} \dfrac{-\pi}{4} & \text{if } -\pi < x \le 0 \\ \dfrac{\pi}{4} & \text{if } 0 < x \le \pi \end{cases}$$

1. 0
2. $-\pi/4$
3. $\pi/4$



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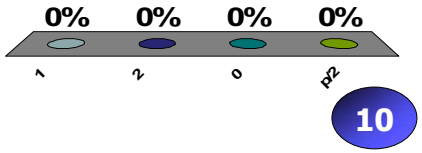
What is the value of the coefficient a_3 in the cosine half-range expansion of the function $f(x) = 1$ on the interval $[0, 1]$?

1. 1
2. 2
3. 0
4. $\pi/2$



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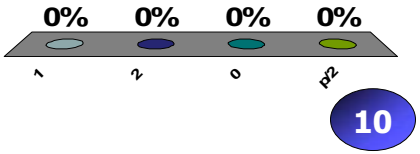
What is the value of the coefficient b_3 in the cosine half-range expansion of the function $f(x) = 1$ on the interval $[0, 1]$?

1. 1
2. 2
3. 0
4. $\pi/2$



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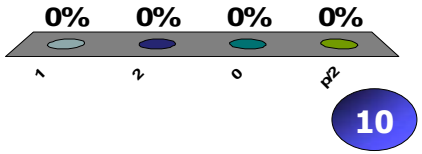
What is the value of the coefficient a_0 in the cosine half-range expansion of the function $f(x) = 1$ on the interval $[0, 1]$?

1. 1
2. 2
3. 0
4. $\pi/2$



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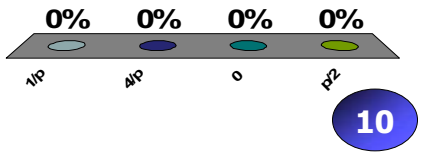
What is the value of the coefficient b_1 in the sine half-range expansion of the function $f(x) = 1$ on the interval $[0, 1]$?

1. $1/\pi$
2. ✓ $4/\pi$
3. 0
4. $\pi/2$



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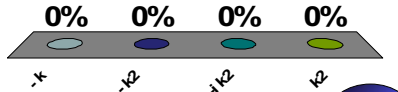
What is the Fourier transform of f''?

1. $-k\ \hat{f}(k)$
2. ✓ $-k^2\ \hat{f}(k)$
3. $-i\,k^2\ \hat{f}(k)$
4. $k^2\ \hat{f}(k)$



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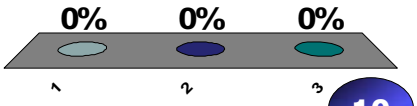
What is the Fourier transform of the following function?

$$f(x) = \begin{cases} \exp(-ax) & \text{if } x > 0 \\ 0 & \text{if } x \le 0 \end{cases}$$

1. $\hat{f}(k) = \dfrac{1}{a+ik}$
2. ✓ $\hat{f}(k) = \dfrac{1}{\sqrt{2\pi}(a+ik)}$
3. $\hat{f}(k) = \dfrac{1}{\sqrt{2\pi}(a-ik)}$



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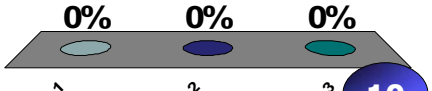
What is the sine Fourier transform, $\mathcal{F}_s(f')(k)$, of f'?

1. $-k\,\mathcal{F}_s(f)(k)$
2. ✓ $-k\,\mathcal{F}_c(f)(k)$
3. $k\,\mathcal{F}_s(f)(k) - \sqrt{\dfrac{2}{\pi}} f(0)$



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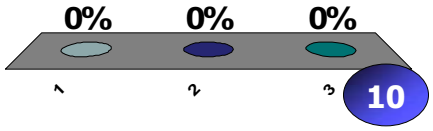
What is the cosine Fourier transform, $\mathcal{F}_c(f')(k)$, of f'?

1. $k\,\mathcal{F}_s(f)(k)$

2. $k\,\mathcal{F}_c(f)(k)$

3. ✔ $k\,\mathcal{F}_s(f)(k) - \sqrt{\frac{2}{\pi}} f(0)$



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