Lecture 7 Activity Results for Test Student

Score for this attempt: **1** out of 1
Submitted Jan 30 at 3:33pm
This attempt took 2 minutes.

Question 1

1 / 1 pts

Consider the two differential equations below.

(DE1): $x^2 u_{xx} + x u_x + u = 0$;

(DE2): $x^2 u_{xx} + x u_x + x^2 u = 0$.

Which statement below is true?

- Both (DE1) and (DE2) are Cauchy-Euler Eqs.
- Both (DE1) and (DE2) are Bessel Eqs.
- Correct! (DE1) is Cauchy-Euler; (DE2) is Bessel.
- (DE1) is Bessel; (DE2) is Cauchy-Euler.
- (DE1) is Cauchy-Euler; (DE2) is neither Cauchy-Euler nor Bessel.

Additional Comments:

Question 2

0 / 0 pts

Which of the following is a Bessel equation? **Select all that apply.**

- [ ] $x^2 u_{xx} + x u_x + 4x^2 u = 0$
- [ ] $x^2 u_{xx} + 2x u_x + (x^2 - 4)u = 0$

Correct!

- [x] $x^2 u_{xx} + x u_x + (x^2 - 4)u = 0$
- [ ] $x^2 u_{xx} + x u_x + (4 - x^2)u = 0$

Correct!

- [x] $x^2 u_{xx} + x u_x + x^2 u = 0$

Additional Comments:

Question 3

0 / 0 pts

For α ≥ 0, consider

$J_\alpha(x)$: the Bessel function of the first kind of order α;

$Y_\alpha(x)$: the Bessel function of the second kind of order α.

Which statement below is true?

Both $\lim_{x \to 0} J_\alpha(x)$ and $\lim_{x \to 0} Y_\alpha(x)$ are finite.

Both $\lim_{x \to 0} J_\alpha(x)$ and $\lim_{x \to 0} Y_\alpha(x)$ are infinity.

Correct!

$\lim_{x \to 0} J_\alpha(x)$ is finite; $\lim_{x \to 0} Y_\alpha(x)$ is infinity.

$\lim_{x \to 0} J_\alpha(x)$ is infinity; $\lim_{x \to 0} Y_\alpha(x)$ is finite.

$\lim_{x \to 0} J_\alpha(x)$ does not exist; $\lim_{x \to 0} Y_\alpha(x)$ is infinity.

Additional Comments:

Question 4

0 / 0 pts

Consider $J_0(x)$, the Bessel function of the first kind of order 0.

Which statement below is true?

$J_0(x)$ has no zero for $x \in (0, +\infty)$.

$J_0(x)$ has exactly one zero for $x \in (0, +\infty)$.

$J_0(x)$ has finite number of zeros for $x \in (0, +\infty)$.

Correct!

$J_0(x)$ has an infinite sequence of zeros for $x \in (0, +\infty)$.

$J_0(x)$ has zeros for $x \in (0, \pi^2)$ but no zero for $x \in (\pi^2, +\infty)$.

Additional Comments:

Question 5

0 / 0 pts

For α ≥ 0, consider

$J_\alpha(x)$: the Bessel function of the first kind of order α;

$Y_\alpha(x)$: the Bessel function of the second kind of order α.

Let $u(x)$ be a general solution of $x^2 u_{xx} + x u_x + (x^2 - \alpha^2)u = 0$.

What can we say about $u(x)$?

$u(x) = c_1 J_\alpha(x)$

$u(x) = c_2 Y_\alpha(x)$

Correct!

$u(x) = c_1 J_\alpha(x) + c_2 Y_\alpha(x)$

There is not enough information to write out a general solution $u(x)$.

$u(x) = c_1 J_\alpha(x) + c_2 x J_\alpha(x)$

Additional Comments:

Question 6

0 / 0 pts

Consider the two differential equations below

(DE1): $x^2 u_{xx} + x u_x + \lambda x^2 u = 0$ for λ > 0;

(DE2): $x^2 u_{xx} + x u_x + x^2 u = 0$.

(DE2) is the Bessel Eq of order 0.

Which statement below is true?

- It is impossible to transform (DE1) to (DE2).

Correct!

- We can transform (DE1) to (DE2) via a linear scaling $z = \beta x$.
- We can transform (DE1) to (DE2) only via a non-linear scaling $z = (\beta x)^{\eta}$.
- We can transform (DE1) to (DE2) via a shifting $z = x - x_0$.
- We can transform (DE1) to (DE2) only via a non-linear scaling $z = e^{\beta x}$.

Additional Comments:

Question 7

0 / 0 pts

Consider the two differential equations below

(DE1): $x^2 u_{xx} + x u_x + \lambda x u = 0$ for λ > 0;

(DE2): $x^2 u_{xx} + x u_x + x^2 u = 0$.

(DE2) is the Bessel Eq of order 0.

Which statement below is true?

- It is impossible to transform (DE1) to (DE2).
- We can transform (DE1) to (DE2) via a linear scaling $z = \beta x$.

Correct!

- We can transform (DE1) to (DE2) only via a non-linear scaling $z = (\beta x)^\eta$.
- We can transform (DE1) to (DE2) via a shifting $z = x - x_0$.
- We can transform (DE1) to (DE2) only via a non-linear scaling $z = e^{\beta x}$.

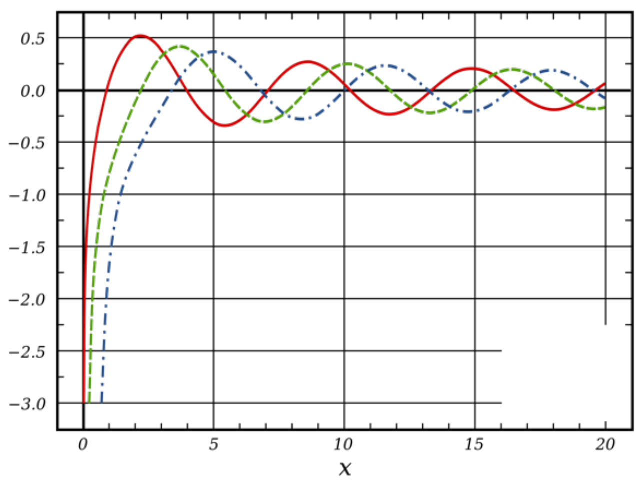
Additional Comments:

Question 8

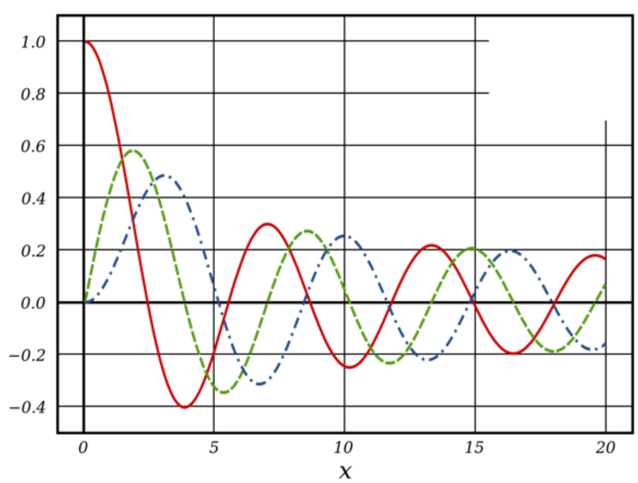
0 / 0 pts

Two pictures below show, respectively, the plots of $\{J_0(x), J_1(x), J_2(x)\}$, and the plots of $\{Y_0(x), Y_1(x), Y_2(x)\}$.

Picture 1:



Picture 2:



Which one is which?

Picture 1 shows the plots of $\{J_0(x), J_1(x), J_2(x)\}$.

Correct!

Picture 2 shows the plots of $\{J_0(x), J_1(x), J_2(x)\}$.

Additional Comments:

Fudge Points: --

You can manually adjust the score by adding positive or negative points to this box.

Final Score: 1 out of 1

Update Scores