

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Euler Method Approximation

Use $y_{n+1} = y_n + h f(x_n, y_n)$. Round each new y-value to four decimal places and use that rounded value in the next row.

1. Use Euler's method for $y' = 1x - 1y + 1$, $y(0) = 1$, with $h = 0.5$ for 4 steps. Round each new y to four decimals.

2. Use Euler's method for $y' = -2xy - 1$, $y(0) = 1$, with $h = 0.5$ for 4 steps. Round each new y to four decimals.

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Use $y_{n+1} = y_n + h f(x_n, y_n)$. Round each new y-value to four decimal places and use that rounded value in the next row.

3. Use Euler's method for $y' = 1xy + 1$, $y(0) = 1$, with $h = 0.5$ for 4 steps. Round each new y to four decimals.

4. Use Euler's method for $y' = 2x + 0y + 2$, $y(0) = 1$, with $h = 0.5$ for 4 steps. Round each new y to four decimals.

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Euler Method Approximation

Worked Answer Key

Use $y_{n+1} = y_n + h f(x_n, y_n)$. Round each new y -value to four decimal places and use that rounded value in the next row.

- 1. Use Euler's method for $y' = 1x - 1y + 1$, $y(0) = 1$, with $h = 0.5$ for 4 steps. Round each new y to four decimals.**

Answer: $y(2)$ is approximately 2.0625.

1. Use $y_{n+1} = y_n + 0.5 f(x_n, y_n)$ and $x_{n+1} = x_n + 0.5$.
2. $n=0$: (0, 1), $f=0$, $y_{next}=1$; $n=1$: (0.5, 1), $f=0.5$, $y_{next}=1.25$; $n=2$: (1, 1.25), $f=0.75$, $y_{next}=1.625$; $n=3$: (1.5, 1.625), $f=0.875$, $y_{next}=2.0625$
3. After 4 recurrence rows, $x = 2$ and y is approximately 2.0625.
4. This is a numerical approximation; it is not asserted to be an exact solution value.

- 2. Use Euler's method for $y' = -2xy - 1$, $y(0) = 1$, with $h = 0.5$ for 4 steps. Round each new y to four decimals.**

Answer: $y(2)$ is approximately -0.25.

1. Use $y_{n+1} = y_n + 0.5 f(x_n, y_n)$ and $x_{n+1} = x_n + 0.5$.
2. $n=0$: (0, 1), $f=-1$, $y_{next}=0.5$; $n=1$: (0.5, 0.5), $f=-1.5$, $y_{next}=-0.25$; $n=2$: (1, -0.25), $f=-0.5$, $y_{next}=-0.5$; $n=3$: (1.5, -0.5), $f=0.5$, $y_{next}=-0.25$
3. After 4 recurrence rows, $x = 2$ and y is approximately -0.25.
4. This is a numerical approximation; it is not asserted to be an exact solution value.

Euler Method Approximation

Worked Answer Key

Use $y_{n+1} = y_n + h f(x_n, y_n)$. Round each new y -value to four decimal places and use that rounded value in the next row.

3. Use Euler's method for $y' = 1xy + 1$, $y(0) = 1$, with $h = 0.5$ for 4 steps. Round each new y to four decimals.

Answer: $y(2)$ is approximately 7.6094.

1. Use $y_{n+1} = y_n + 0.5 f(x_n, y_n)$ and $x_{n+1} = x_n + 0.5$.
2. $n=0$: (0, 1), $f=1$, $y_{next}=1.5$; $n=1$: (0.5, 1.5), $f=1.75$, $y_{next}=2.375$; $n=2$: (1, 2.375), $f=3.375$, $y_{next}=4.0625$; $n=3$: (1.5, 4.0625), $f=7.09375$, $y_{next}=7.6094$
3. After 4 recurrence rows, $x = 2$ and y is approximately 7.6094.
4. This is a numerical approximation; it is not asserted to be an exact solution value.

4. Use Euler's method for $y' = 2x + 0y + 2$, $y(0) = 1$, with $h = 0.5$ for 4 steps. Round each new y to four decimals.

Answer: $y(2)$ is approximately 8.

1. Use $y_{n+1} = y_n + 0.5 f(x_n, y_n)$ and $x_{n+1} = x_n + 0.5$.
2. $n=0$: (0, 1), $f=2$, $y_{next}=2$; $n=1$: (0.5, 2), $f=3$, $y_{next}=3.5$; $n=2$: (1, 3.5), $f=4$, $y_{next}=5.5$; $n=3$: (1.5, 5.5), $f=5$, $y_{next}=8$
3. After 4 recurrence rows, $x = 2$ and y is approximately 8.
4. This is a numerical approximation; it is not asserted to be an exact solution value.