MATH325: Discrete Mathematics II
Quiz q080401

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Open `main.tex` and enter answers (look for `answercode`, `answerbox`, `answerlong`). Turn the page for detailed instructions. To rebuild and view pdf, in bash shell execute `make`. To build a gzip-tar file, in bash shell execute `make s` and you'll get `submit.tar.gz`.

This is a 10-min quiz.

Q1. Let $a_n = 5a_{n-1}$ be a recurrence relation with $a_0 = 3$. Let $a(x) = \sum_{n=0}^{\infty} a_n x^n$. Compute $a(x)$ as a rational expression, say $a(x) = \frac{P(x)}{Q(x)}$. Write down the coefficients of $P(x)$ and the coefficients of $Q(x)$ starting with the lowest degree. For instance if $P(x) = 2 + 3x$ and $Q(x) = 4 - 5x + 6x^3$, you write `2, 3; 4, -5, 0, 6`.
Answer:

3;1,-5

(You only need to state the answer.)

Q2. Let $b_n = 3b_{n-1} - 2b_{n-2}$ be a recurrence relation with $b_0 = 5, b_1 = 7$. Let $b(x) = \sum_{n=0}^{\infty} b_n x^n$. Compute $b(x)$ as a rational expression, say $b(x) = \frac{P(x)}{Q(x)}$. Write down the coefficients of $P(x)$ and the coefficients of $Q(x)$ starting with the lowest degree. For instance if $P(x) = 2 + 3x$ and $Q(x) = 4 - 5x + 6x^3$, you write `2, 3; 4, -5, 0, 6`.
Answer:

5,-8;1,-3,2

(You only need to state the answer.)

Q3. Let $c_n = 2c_{n-1} + c_{n-3}$ be a recurrence relation with $c_0 = 3, c_1 = -5, c_2 = 7$. Let $c(x) = \sum_{n=0}^{\infty} c_n x^n$. Compute $c(x)$ as a rational expression, say $c(x) = \frac{P(x)}{Q(x)}$. Write down the coefficients of $P(x)$ and the coefficients of $Q(x)$ starting with the lowest degree. For instance if $P(x) = 2 + 3x$ and $Q(x) = 4 - 5x + 6x^3$, you write `2, 3; 4, -5, 0, 6`.
Answer:

3,-11,17;1,-2,0,-1

(You only need to state the answer.)

Instructions

In `main.tex` change the email address in

```
\renewcommand\AUTHOR{jdoe5@cougars.ccis.edu}
```

yours. In the bash shell, execute "`make`" to recompile `main.pdf`. Execute "`make v`" to view `main.pdf`. Execute "`make s`" to create `submit.tar.gz` for submission.

For each question, you'll see boxes for you to fill. You write your answers in `main.tex` file. For small boxes, if you see

```
1 + 1 = \answerbox{}.
```

you do this:

```
1 + 1 = \answerbox{2}.
```

`answerbox` will also appear in "true/false" and "multiple-choice" questions.

For longer answers that needs typewriter font, if you see

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
\end{answercode}
```

you do this:

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
int x;
\end{answercode}
```

`answercode` will appear in questions asking for code, algorithm, and program output. In this case, indentation and spacing is significant. For program output, I do look at spaces and newlines.

For long answers (not in typewriter font) if you see

```
What is the color of the sky?
\begin{answerlong}
\end{answerlong}
```

you can write

```
What is the color of the sky?
\begin{answerlong}
The color of the sky is blue.
\end{answerlong}
```

For students beyond 245: You can put LaTeX commands in `answerbox` and `answerlong`.

A question that begins with "T or F or M" requires you to identify whether it is true or false, or meaningless. "Meaningless" means something's wrong with the statement and it is not well-defined. Something like "$1+_2$" or "$\{2\}^{\{3\}}$" is not well-defined. Therefore a question such as "Is $42 = 1+_2$ true or false?" or "Is $42 = \{2\}^{\{3\}}$ true or false?" does not make sense. "Is $P(42) = \{42\}$ true or false?" is meaningless because $P(X)$ is only defined if X is a set. For "Is $1 + 2 + 3$ true or false?", "$1 + 2 + 3$" is well–defined but as a "numerical expression", not as a "proposition", i.e., it cannot be true or false. Therefore "Is $1 + 2 + 3$ true or false?" is also not a well-defined question.

When writing results of computations, make sure it's simplified. For instance write 2 instead of $1 + 1$. When you write down sets, if the answer is $\{1\}$, I do not want to see $\{1, 1\}$.

When writing a counterexample, always write the simplest.

Here are some examples (see `instructions.tex` for details):

1. T or F or M: $1 + 1 = 2$ ..... T
2. T or F or M: $1 + 1 = 3$ ..... F
3. T or F or M: $1+^2 =$ ..... M
4. $1 + 2 =$ 3
5. Write a C++ statement to declare an integer variable named `x`.

   ```
   int x;
   ```

6. Solve $x^2 - 1 = 0$.

   Since $x^2 - 1 = (x - 1)(x + 1)$, $x^2 - 1 = 0$ implies $(x - 1)(x + 1) = 0$. Therefore $x - 1 = 0$ or $x = -1$. Hence $x = 1$ or $x = -1$.

7. Which is true? C
   (A) $1 + 1 = 0$
   (B) $1 + 1 = 1$
   (C) $1 + 1 = 2$
   (D) $1 + 1 = 3$
   (E) $1 + 1 = 4$