UNIVERSITY OF TORONTO

Faculty of Arts and Science

Midterm 1 CSC165H1S

Duration: 50 minutes
Instructor(s): David Liu, Toniann Pitassi

No Aids Allowed



midterm1 1-1

Name:

Student Number:

Please read the following guidelines carefully!

- Please write your name on both the front and back of this exam.
- This examination has 4 questions. There are a total of 8 pages, DOUBLE-SIDED.
- Answer questions clearly and completely, with justifications unless explicitly asked not to.
- Unless stated otherwise, your formulas can use *only* the propositional connectives and quantifiers we have seen in class, arithmetic operators (like +, ×, and exponentiation), comparison operators (like = and >), and the divisibility and *Prime* predicates. You may not define your own sets or predicates unless asked to do so.
- All formulas must have negations applied directly to propositional variables or predicates (e.g., $\neg Prime(n)$). You do *not* need to show your work for computing negations.
- In your proofs, you may always use definitions of predicates. You may *not* use any external facts about rates of growth, divisibility, primes, or greatest common divisor unless you prove them, or they are given to you in the question.
- You may **not** use induction for your proofs on this midterm.

Take a deep breath.

This is your chance to show us
How much you've learned.
We **WANT** to give you the credit
That you've earned.

A number does not define you.

Good luck!



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

 ${\rm Midterm}\ 1$

1. [2 marks] Here is question 1.



 ${\rm Midterm}\ 1$

 $\underline{\mathrm{CSC165H1S}}$, Winter 2017

2. [2 marks] Here is question 2.

3. [3 marks] Here is question 3.



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$

4. [4 marks] Here is a multi-page question.



 ${\rm Midterm}\ 1$

 $\underline{\mathrm{CSC}165\mathrm{H}1\mathrm{S}}$, Winter 2017

Question 4 continued...



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

Midterm 1



Midterm 1

CSC165H1S, Winter 2017



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

Midterm 1

Name:

Question	Grade	Out of
Q1		2
Q2		2
Q3		3
Q4		4
Total		11

UNIVERSITY OF TORONTO

Faculty of Arts and Science

Midterm 1 CSC165H1S

Duration: 50 minutes
Instructor(s): David Liu, Toniann Pitassi

No Aids Allowed



midterm1 2-1

Name:

Student Number:

Please read the following guidelines carefully!

- Please write your name on both the front and back of this exam.
- This examination has 4 questions. There are a total of 8 pages, DOUBLE-SIDED.
- Answer questions clearly and completely, with justifications unless explicitly asked not to.
- Unless stated otherwise, your formulas can use *only* the propositional connectives and quantifiers we have seen in class, arithmetic operators (like +, ×, and exponentiation), comparison operators (like = and >), and the divisibility and *Prime* predicates. You may not define your own sets or predicates unless asked to do so.
- All formulas must have negations applied directly to propositional variables or predicates (e.g., $\neg Prime(n)$). You do *not* need to show your work for computing negations.
- In your proofs, you may always use definitions of predicates. You may *not* use any external facts about rates of growth, divisibility, primes, or greatest common divisor unless you prove them, or they are given to you in the question.
- You may **not** use induction for your proofs on this midterm.

Take a deep breath.

This is your chance to show us
How much you've learned.
We **WANT** to give you the credit

That you've earned.

A number does not define you.

Good luck!



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$

1. [2 marks] Here is question 1.



CSC165H1S, Winter 2017

Midterm 1

2. [2 marks] Here is question 2.

3. [3 marks] Here is question 3.



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$

4. [4 marks] Here is a multi-page question.



 ${\rm Midterm}\ 1$

Question 4 continued...

 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

 ${\rm Midterm}\ 1$



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

Midterm 1

Name:

Question	Grade	Out of
Q1		2
Q2		2
Q3		3
Q4		4
Total		11

UNIVERSITY OF TORONTO

Faculty of Arts and Science

Midterm 1 CSC165H1S

Duration: 50 minutes
Instructor(s): David Liu, Toniann Pitassi

No Aids Allowed



midterm1 3-1

Name:

Student Number:

Please read the following guidelines carefully!

- Please write your name on both the front and back of this exam.
- This examination has 4 questions. There are a total of 8 pages, DOUBLE-SIDED.
- Answer questions clearly and completely, with justifications unless explicitly asked not to.
- Unless stated otherwise, your formulas can use *only* the propositional connectives and quantifiers we have seen in class, arithmetic operators (like +, ×, and exponentiation), comparison operators (like = and >), and the divisibility and *Prime* predicates. You may not define your own sets or predicates unless asked to do so.
- All formulas must have negations applied directly to propositional variables or predicates (e.g., $\neg Prime(n)$). You do *not* need to show your work for computing negations.
- In your proofs, you may always use definitions of predicates. You may *not* use any external facts about rates of growth, divisibility, primes, or greatest common divisor unless you prove them, or they are given to you in the question.
- You may **not** use induction for your proofs on this midterm.

Take a deep breath.

This is your chance to show us
How much you've learned.
We **WANT** to give you the credit
That you've earned.

indi you ve carried.

A number does not define you.

Good luck!



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$

1. [2 marks] Here is question 1.



 ${\rm Midterm}\ 1$

 $\underline{\text{CSC165H1S}}$, Winter 2017

2. [2 marks] Here is question 2.

3. [3 marks] Here is question 3.



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$

4. [4 marks] Here is a multi-page question.



 ${\rm Midterm}\ 1$

Question 4 continued...

 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

 ${\rm Midterm}\ 1$



Midterm 1

CSC165H1S, Winter 2017



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

Midterm 1

Name:

Question	Grade	Out of
Q1		2
Q2		2
Q3		3
Q4		4
Total		11

UNIVERSITY OF TORONTO

Faculty of Arts and Science

Midterm 1 CSC165H1S

Duration: 50 minutes
Instructor(s): David Liu, Toniann Pitassi

No Aids Allowed



midterm1 4-1

Name:

Student Number:

Please read the following guidelines carefully!

- Please write your name on both the front and back of this exam.
- This examination has 4 questions. There are a total of 8 pages, DOUBLE-SIDED.
- Answer questions clearly and completely, with justifications unless explicitly asked not to.
- Unless stated otherwise, your formulas can use *only* the propositional connectives and quantifiers we have seen in class, arithmetic operators (like +, ×, and exponentiation), comparison operators (like = and >), and the divisibility and *Prime* predicates. You may not define your own sets or predicates unless asked to do so.
- All formulas must have negations applied directly to propositional variables or predicates (e.g., $\neg Prime(n)$). You do *not* need to show your work for computing negations.
- In your proofs, you may always use definitions of predicates. You may *not* use any external facts about rates of growth, divisibility, primes, or greatest common divisor unless you prove them, or they are given to you in the question.
- You may **not** use induction for your proofs on this midterm.

Take a deep breath.

This is your chance to show us
How much you've learned.
We **WANT** to give you the credit
That you've earned.

indi you ve carried.

A number does not define you.

Good luck!



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

 ${\rm Midterm}\ 1$

1. [2 marks] Here is question 1.



 ${\rm Midterm}\ 1$

midterm1 4-3

CSC165H1S, Winter 2017

2. [2 marks] Here is question 2.

3. [3 marks] Here is question 3.



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$

4. [4 marks] Here is a multi-page question.



 ${\rm Midterm}\ 1$

 $\underline{\mathrm{CSC}165\mathrm{H}1\mathrm{S}}$, Winter 2017

Question 4 continued...



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

 ${\rm Midterm}\ 1$



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

 ${\rm Midterm}\ 1$

Name:

Question	Grade	Out of
Q1		2
Q2		2
Q3		3
Q4		4
Total		11

UNIVERSITY OF TORONTO

Faculty of Arts and Science

Midterm 1 CSC165H1S

Duration: 50 minutes
Instructor(s): David Liu, Toniann Pitassi

No Aids Allowed



midterm1 5-1

Name:

Student Number:

Please read the following guidelines carefully!

- Please write your name on both the front and back of this exam.
- This examination has 4 questions. There are a total of 8 pages, DOUBLE-SIDED.
- Answer questions clearly and completely, with justifications unless explicitly asked not to.
- Unless stated otherwise, your formulas can use *only* the propositional connectives and quantifiers we have seen in class, arithmetic operators (like +, ×, and exponentiation), comparison operators (like = and >), and the divisibility and *Prime* predicates. You may not define your own sets or predicates unless asked to do so.
- All formulas must have negations applied directly to propositional variables or predicates (e.g., $\neg Prime(n)$). You do *not* need to show your work for computing negations.
- In your proofs, you may always use definitions of predicates. You may *not* use any external facts about rates of growth, divisibility, primes, or greatest common divisor unless you prove them, or they are given to you in the question.
- You may **not** use induction for your proofs on this midterm.

Take a deep breath.

This is your chance to show us
How much you've learned.
We **WANT** to give you the credit
That you've earned.

A number does not define you.

Good luck!



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$

1. [2 marks] Here is question 1.



 ${\rm Midterm}\ 1$

CSC165H1S, Winter 2017

2. [2 marks] Here is question 2.

3. [3 marks] Here is question 3.



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$

4. [4 marks] Here is a multi-page question.



 ${\rm Midterm}\ 1$

 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

Question 4 continued...



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

Midterm 1



CSC165H1S, Winter 2017

 ${\rm Midterm}\ 1$



 $\mathrm{CSC}165\mathrm{H}1\mathrm{S}$, Winter 2017

 ${\rm Midterm}\ 1$

Name:

Question	Grade	Out of
Q1		2
Q2		2
Q3		3
Q4		4
Total		11