first name	last name		$\mathrm{id}\#$			
each question 8 marks	30 min	closed book	no devices	3 pages	page 1	
1 By hand find the la	reast intogo	$r t < \sqrt{47003}$	Use the old school	sauero root (lgorithm	

1. By hand, find the largest integer $t \leq \sqrt{47093}$. Use the old-school square root algorithm from class. Show your work.

first name	las	st name	$\mathrm{id}\#$	-	
each question 8 marks	30 min	closed book	no devices	3 pages	page 2
2. a) In the box, show	v the outpu	t from			
this python progra	m.				
<pre>def collatz(n):</pre>					
<pre>print(n, end='</pre>	': ')				
while $n > 1$:					
print(n, end	d=' ')				
if n % 2 ==	0: n = n	// 2			
else: n = n*	×3 + 1				
<pre>print(n)</pre>					
for j in range(2	2,7): #from	m 2 to 6			
collatz(j)					

b) Prove or disprove (if you can): if the Collatz conjecture fails for some integer, and if x is the smallest such integer, then x is odd.

first name	last name		$\mathrm{id}\#$			
each question 8 marks	30 min	closed book	no devices	3 pages	page 3	
3. Explain why the runtime of ifib(n)			<pre>def ifib(n):</pre>			
is proportional to $\sum_{j=1}^{n} \lg(\operatorname{fib}(j))$.)).	a,b = 0,1 for _ in range(n):			
		, , , -				
			a, b =	b, a+b		
			return a			

first name	last name		$\mathrm{id}\#$			
each question 8 marks	30 min	closed book	no devices	3 pages	page 1	
1 By hand find that	raget intorg	$r t < \sqrt{45410}$	Use the old school	sauero root (lgorithm	

1. By hand, find the largest integer $t \leq \sqrt{45419}$. Use the old-school square root algorithm from class. Show your work.

first name	las	st name	$\mathrm{id}\#$:	
each question 8 marks	30 min	closed book	no devices	3 pages	page 2
2. a) In the box, show	the output	t from			
this python program	m.				
<pre>def collatz(n):</pre>					
<pre>print(n, end='</pre>	: ')				
while $n > 1$:					
<pre>print(n, end</pre>	=' ')				
if n % 2 ==	0: n = n ,	// 2			
else: n = n*	3 + 1				
<pre>print(n)</pre>					
for j in range(3	,7): #from	n 3 to 6			
collatz(j)					

b) Prove or disprove (if you can): if the Collatz conjecture fails for some integer, and if y is the smallest such integer, then y is odd.

first name	last name		$\mathrm{id}\#$			
each question 8 marks	30 min	closed book	no devices	3 pages	page 3	
3. Explain why the runtime of ifib(n)			<pre>def ifib(n):</pre>			
is proportional to $\sum_{j=1}^{n} \lg(\operatorname{fib}(j))$.)).	a,b = 0,1 for _ in range(n):			
		, , , -				
			a, b =	b, a+b		
			return a			

first name	last name		$\mathrm{id}\#$			
each question 8 marks	30 min	closed book	no devices	3 pages	page 1	
					1 • 1	

1. By hand, find the largest integer $t \leq \sqrt{47171}$. Use the old-school square root algorithm from class. Show your work.

first name	las	st name	$\mathrm{id}\#$	-	
each question 8 marks	30 min	closed book	no devices	3 pages	page 2
2. a) In the box, show	w the output	t from			
this python progra	m.				
<pre>def collatz(n):</pre>					
<pre>print(n, end=)</pre>	': ')				
while $n > 1$:					
print(n, end	d=' ')				
if n % 2 ==	0: n = n	// 2			
else: n = n	∗3 + 1				
<pre>print(n)</pre>					
for j in range(1	1,7): #from	n 1 to 6			
collatz(j)					

b) Prove or disprove (if you can): if the Collatz conjecture fails for some integer, and if z is the smallest such integer, then z is odd.

first name	last name		$\mathrm{id}\#$			
each question 8 marks	30 min	closed book	no devices	3 pages	page 3	
3. Explain why the runtime of ifib(n)			<pre>def ifib(n):</pre>			
is proportional to $\sum_{j=1}^{n} \lg(\operatorname{fib}(j))$.)).	a,b = 0,1 for _ in range(n):			
		, , , -				
			a, b =	b, a+b		
			return a			