

### Question 1

Flag question

Mark 1.00 out of 1.00

Correct

An equation solver has converged and its error history is given below. What is the rate of convergence?

 $[1.73205, 1.29904, 0.974279, 0.730709, 0.548032, 0.411024, 0.308268, 0.231201, 0.173401, 0.13005, 0.0975379, 0.0731534, 0.0548651, 0.0411488, 0.0308616, 0.0231462, 0.0173596, 0.0130197, 0.0097648, 0.0073236, 0.0054927, 0.00411953, 0.00308964, 0.00231723, 0.00173792, 0.00130344, 0.000977583, 0.000733187, 0.00054989, 0.000412418, 0.000309313, 0.000231985, 0.000173989, 0.000130492, 0.0000978686, 0.0000734015, 0.0000550511, 0.0000412883, 0.0000309663, 0.0000232247, 0.0000174185, 0.0000130639, 9.79792*10^-6, 7.34844*10^-6, 5.51133*10^-6, 4.1335*10^-6, 3.10012*10^-6, 2.32509*10^-6, 1.74382*10^-6, 1.30786*10^-6, 9.80898*10^-7, 7.35673*10^-7, 5.51755*10^-7, 4.13816*10^-7, 3.10362*10^-7, 2.32772*10^-7, 1.74579*10^-7, 1.30934*10^-7, 9.82005*10^-8, 7.36504*10^-8, 5.52378*10^-8, 4.14284*10^-8, 3.10713*10^-8]$ 

☑ a. 1

~

It's remarkably stable 1.

 $\Box$  b.  $(1/2)(1+\sqrt{5})$ 

□ c. 2

Check

Your answer is correct.

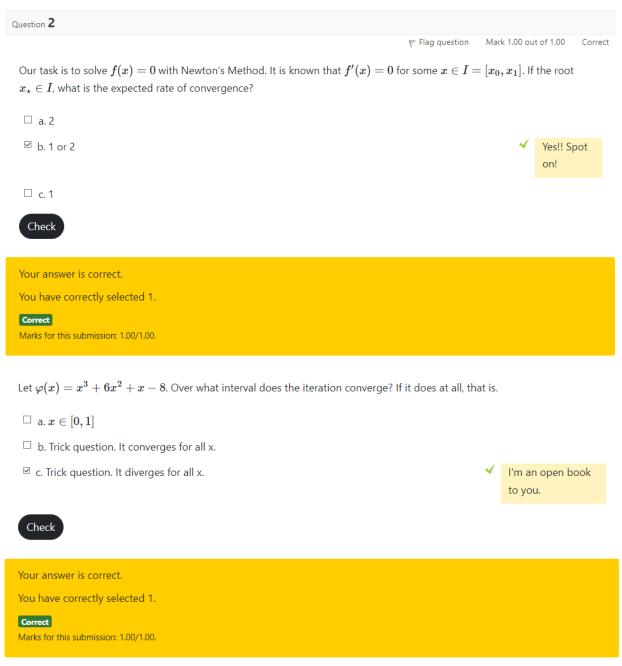
You have correctly selected 1.

Correct

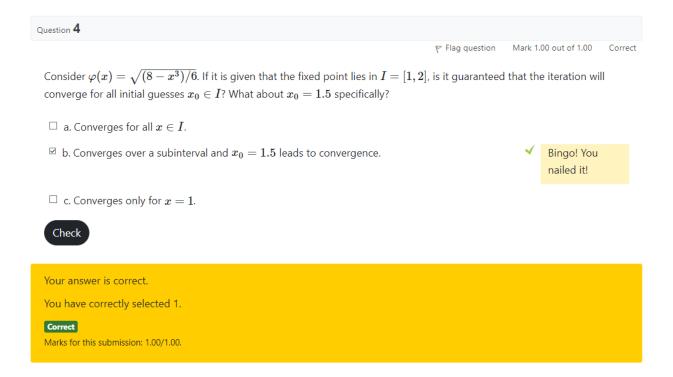
Marks for this submission: 1.00/1.00.

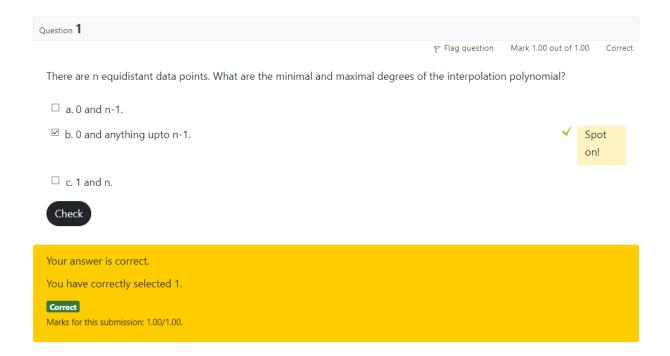
Use the below formula, where alpha is the rate of convergence

$$\alpha = \frac{\ln\left(\frac{e_{n+1}}{e_n}\right)}{\ln\left(\frac{e_n}{e_{n-1}}\right)}$$



Just plug in x = any number, then get the result, and then plug in that result again. Do this repeatedly and we can see this iteration method seems to diverge for all x.





### Question $\bf 2$

Flag question

Mark 1.00 out of 1.00

Correct

Data points  $\{x,y\} = \{\{0,0\},\{1,3\},\{2,4\},\{4,-2\}\}$ . What are the coefficients of the interpolating polynomial in the natural basis?

$$\square$$
 a.  $\{0,3,4,-2\}$ 

$$\ ^{igstyle 2}$$
 b.  $\left\{0, rac{23}{6}, -rac{3}{4}, -rac{1}{12}
ight\}$ 

Well done!

$$\square$$
 c.  $\left\{0,3,-1,-rac{1}{12}
ight\}$ 



Your answer is correct.

You have correctly selected 1.

### Correct

Marks for this submission: 1.00/1.00.

### Question $\bf 3$

Flag question

Mark 1.00 out of 1.00

Correc

Data points  $\{x,y\} = \{\{0,0\},\{1,3\},\{2,4\},\{4,-2\}\}$ . What are the coefficients of the interpolating polynomial in the Lagrange basis?

$$\ ^{ullet}$$
 a.  $\{0,3,4,-2\}$ 

**√** 

Well done!

$$\Box$$
 b.  $\left\{0, \frac{23}{6}, -\frac{3}{4}, -\frac{1}{12}\right\}$ 

$$\Box$$
 c.  $\{0,3,-1,-\frac{1}{12}\}$ 

Check

Your answer is correct.

You have correctly selected 1.

### Correct

Marks for this submission: 1.00/1.00.

Mark 1.00 out of 1.00

Correct

Data points  $\{x,y\} = \{\{0,0\},\{1,3\},\{2,4\},\{4,-2\}\}$ . What are the coefficients of the interpolating polynomial in the Newton basis?

- $\Box$  a.  $\{0, 3, 4, -2\}$
- $\Box$  b.  $\left\{0, rac{23}{6}, -rac{3}{4}, -rac{1}{12}
  ight\}$
- $\ ^{igstyle 2}$  c.  $\left\{0,3,-1,-rac{1}{12}
  ight\}$

✓ Well done

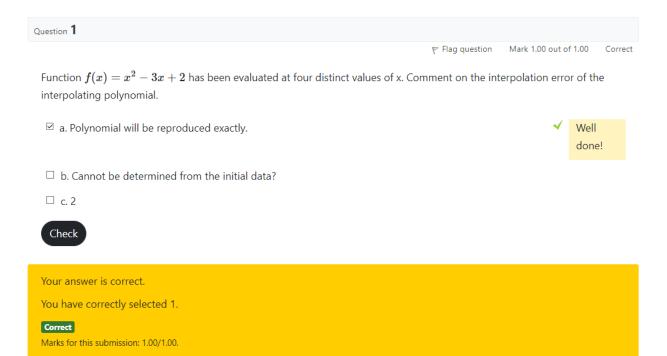
Check

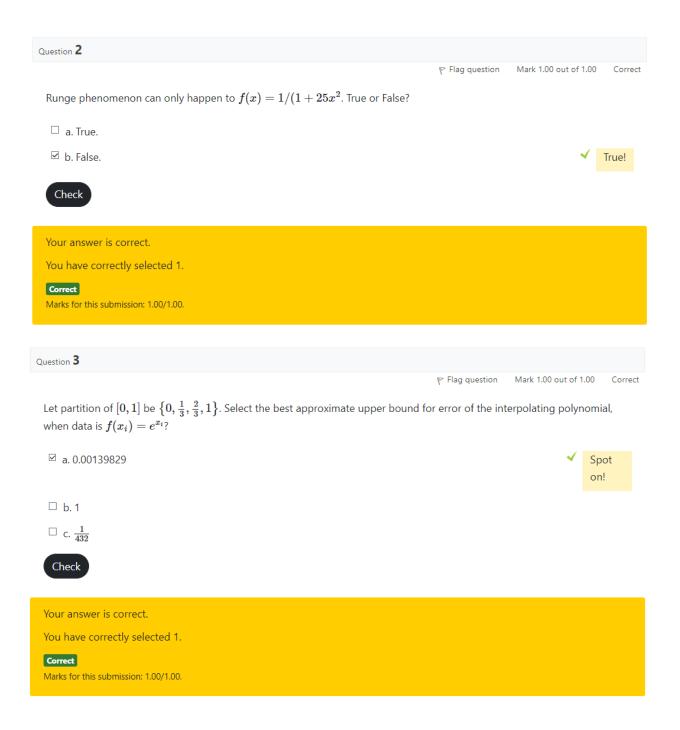
Your answer is correct.

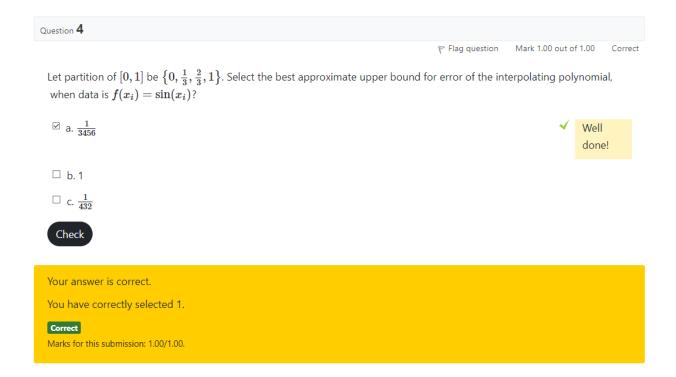
You have correctly selected 1.

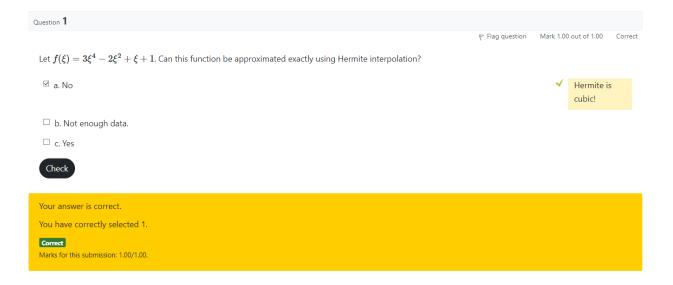
Correct

Marks for this submission: 1.00/1.00.









### Question 2 Flag question Mark 1.00 out of 1.00 We have $\frac{1}{3}\left(-24x^3-28x^2-5x+2\right)$ , $-1\leq x\leq -\frac{1}{3}$ and $-a_2x^2+x+\frac{26}{27}$ , $-\frac{1}{3}\leq x\leq \frac{1}{3}$ . Determine the value of $a_2$ in the case Hermite interpolation. □ a. 1 □ b. 5/4 ✓ Excellent! ☑ c. 4/3 Check Your answer is correct. You have correctly selected 1. Correct Marks for this submission: 1.00/1.00. Question 3 ⟨ Flag question Mark 1.00 out of 1.00 Correct We have $-\frac{10x^2}{9}+x+\frac{77}{81},-\frac{1}{3}\leq x\leq \frac{1}{3}$ and $\frac{1}{9}\left(96x^3-106x^2+41x+5\right),\frac{1}{3}\leq x\leq 1$ . Is this correct, if Hermite interpolation is assumed? ☑ a. Yes ✓ Spot on! □ b. No Check Your answer is correct. You have correctly selected 1. Correct Marks for this submission: 1.00/1.00. Question 4 Flag question Mark 1.00 out of 1.00 Correct A set of data has been approximated with splines as $-x^3-3x^2-x+2, -1 \leq x \leq 0$ and $x^3-3x^2-x+2, 0 \le x \le 1$ . Is this natural spline? 2nd derivatives are zero at the ☑ a. Yes end points. □ b. No Check

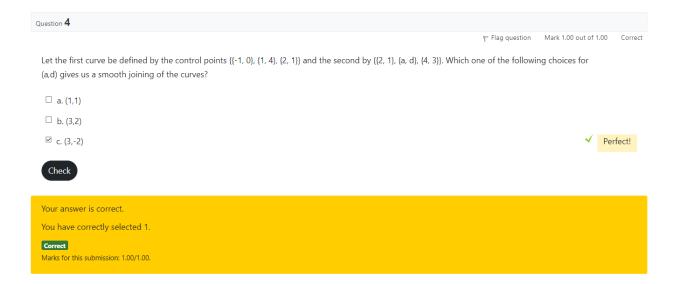
Your answer is correct.

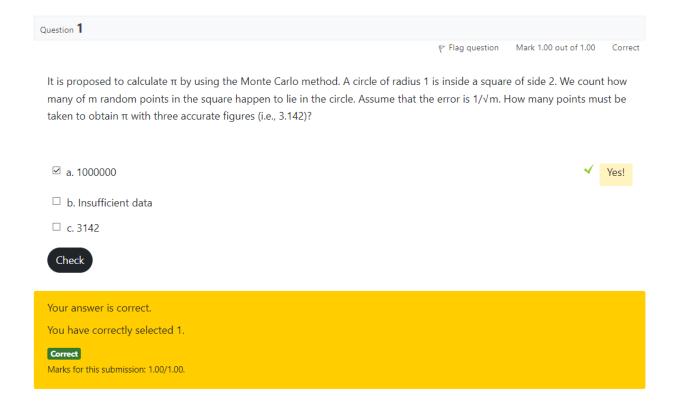
You have correctly selected 1.

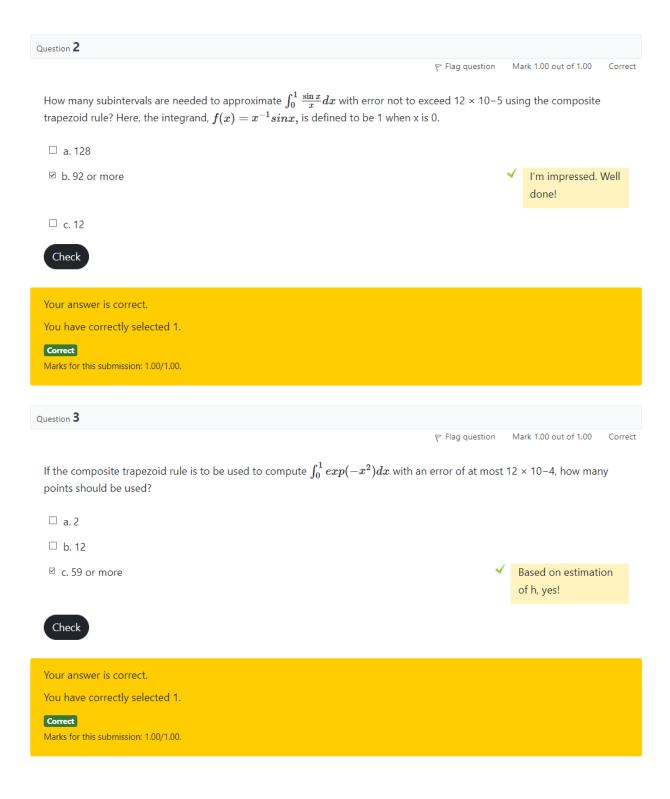
Correct

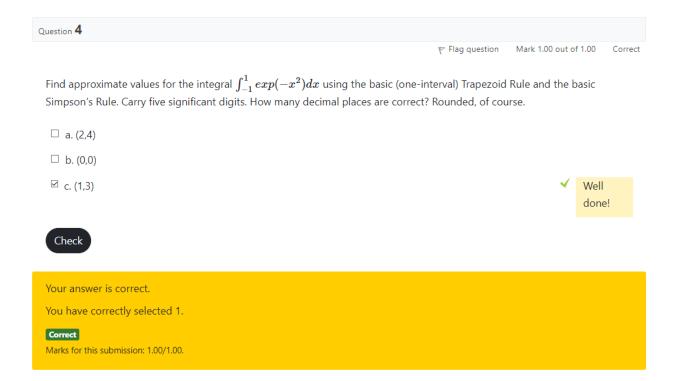
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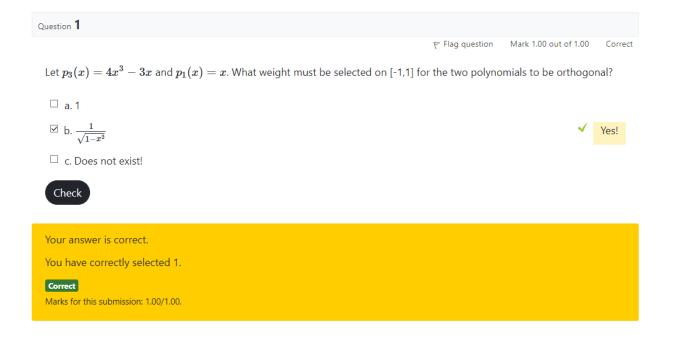
Question 1	
	Flag question Mark 1.00 out of 1.00 Correct
True or false: $t=\sum_{i=0}^n rac{i}{n}B_i^n(t), n>0$ ?	
☑ a. True	✓ Wow!
□ b. False	
Check	
Greek	
Your answer is correct.	
You have correctly selected 1.	
Correct Marks for this submission: 1.00/1.00.	
mana tar una saurinasioni (taa) (taa)	
Question 2	
	₹ Flag question Mark 1.00 out of 1.00 Correct
How many control points are required to draw a circle exactly with a closed Bezier curve?	
$\ \square$ a. 4n, where $n>0$ integer.	
□ b.4	
☑ c.∞	Think of the series representation of the
	exact parametric curve.
Check	
Your answer is correct.	
You have correctly selected 1.	
Correct  Marks for this submission: 1.00/1.00.	
Question 3	
	্ছ Flag question Mark 1.00 out of 1.00 Correct
The control points are {{-1, 0}, {1, 4}, {2, 1}, {-3, -4}, {-1, 0}}. Is the resulting Bezier curve smooth?	F Flag question Mark 1.00 out of 1.00 Correct
The control points are {{-1, 0}, {1, 4}, {2, 1}, {-3, -4}, {-1, 0}}. Is the resulting Bezier curve smooth?	্ব্ Flag question Mark 1.00 out of 1.00 Correct
	₹ Flag question Mark 1.00 out of 1.00 Correct  ✓ Yes,
□ a. False	
□ a. False	✓ Yes,
□ a. False ☑ b. True	✓ Yes,
□ a. False □ b. True  Check  Your answer is correct.	✓ Yes,
□ a. False □ b. True  Check  Your answer is correct. You have correctly selected 1.	✓ Yes,
□ a. False □ b. True Check Your answer is correct.	✓ Yes,

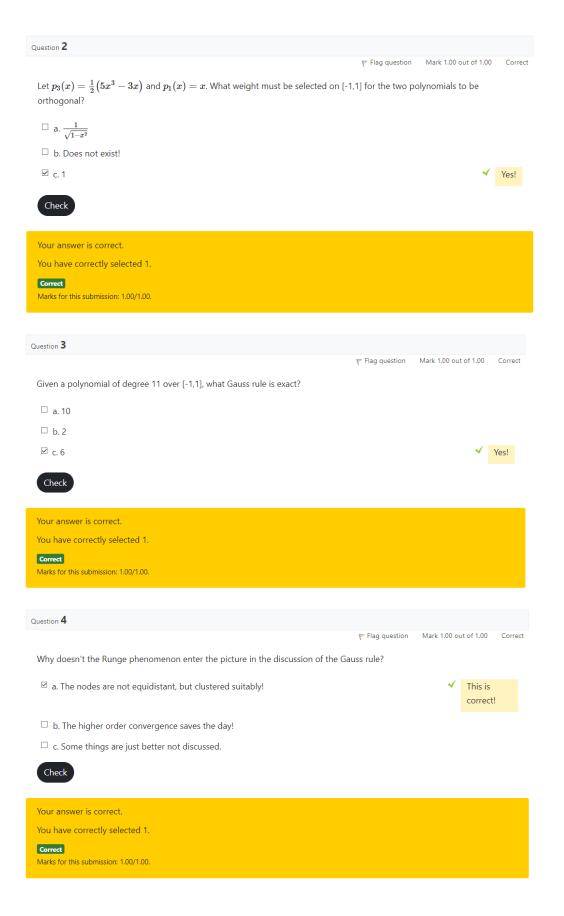


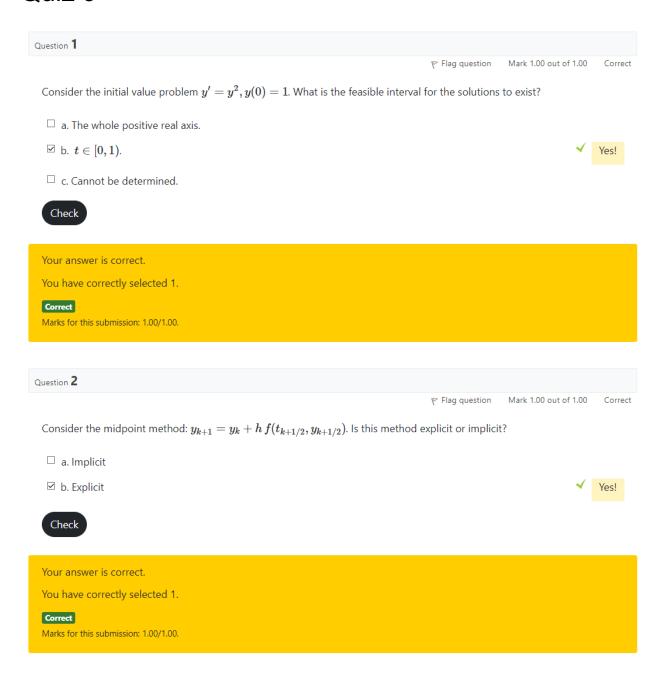


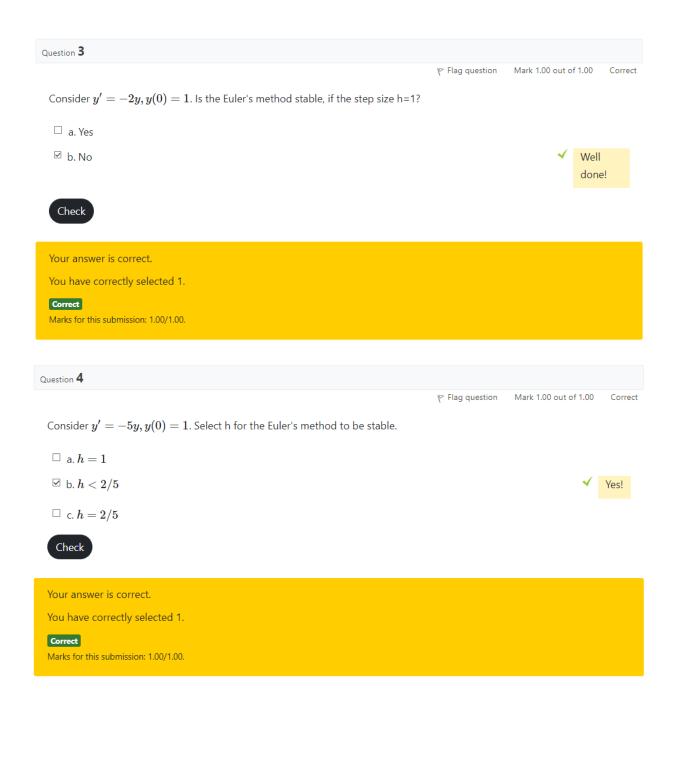


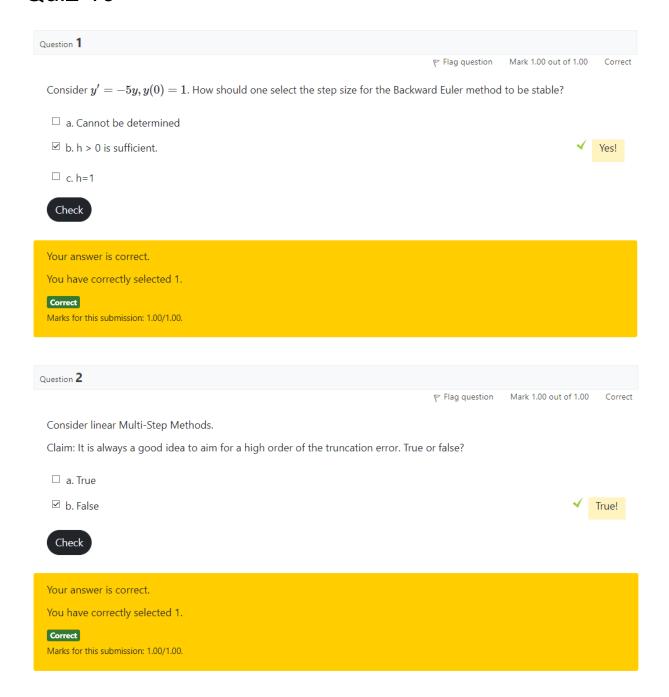












#### Question 3

Flag question M

Mark 1.00 out of 1.00

Correct

Consider Heun's method:  $ilde{y}_{k+1}=y_k+hf(t_k,y_k)$ ,  $y_{k+1}=y_k+rac{h}{2}(f(t_k,y_k)+f(t_{k+1}, ilde{y}_{k+1}))$ .

What is the underlying quadrature rule?

- $\square$  a. Cannot be determined.
- ☑ b. Trapeziodal rule.



☐ c. Simpson's rule



Your answer is correct.

You have correctly selected 1.

### Correct

Marks for this submission: 1.00/1.00.

### Question 4

Flag question

Mark 1.00 out of 1.00

Correct

Consider the 4th order Runge-Kutta method:

$$q_1 = f(t_k, y_k),$$

$$q_2=f(t_k+rac{h}{2},y_k+rac{h}{2}q_1)$$

$$q_3=f(t_k+rac{h}{2},y_k+rac{h}{2}q_2)$$

$$q_4 = f(t_k + h, y_k + hq_3)$$

$$y_{k+1} = y_k + rac{h}{6}(q_1 + 2q_2 + 2q_3 + q_4)$$
 .

What is the underlying quadrature rule?

 $\ \ \square$  a. Simpson's rule



- ☐ b. Trapezoidal rule
- ☐ c. Cannot be determined

Check

Your answer is correct.

You have correctly selected 1.

Correct

Marks for this submission: 1.00/1.00.