Quiz 1

Question **1**

Flag question Mark 1.00 out of 1.00 Correct

Consider the system introduced in the lecture notes, but now with three bits. What is the machine epsilon? Use decimal notation, for instance, 3.24.

- ☐ a. 1.25
- ☐ b. 0
- ☑ c. 0.125

✓ Perfect!

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 Correct

Consider the system introduced in the lecture notes, but now with three bits. Using standard rounding (nearest, and in tie break, choose the one closest to zero), compute the decimal expression 1.1 + 1.3 with the system and return the answer as a decimal expression.

Use decimal notation, for instance, 3.24.

- ☐ a. 2.5
- ☐ b. 2.375
- ☑ c. 2.25

✓ Well done!

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

Let $f(x) = \sin(x)$. What is the absolute condition number at $x = \pi$?

- ☐ a. -1
- ☐ b. 0
- ☑ c. 1

✓ Perfect!

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

Let $f(x) = \sin(x)$. What is the relative condition number at $x = 0$?

- ☐ a. 0
- ☑ b. 1

✓ Chapeau! Well done.

- ☐ c. ∞

Check

Your answer is correct.

You have correctly selected 1.

Correct

Marks for this submission: 1.00/1.00.

Quiz 2

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.
- ☐ 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

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

Question **2**

Flag question Mark 1.00 out of 1.00 Correct

Our task is to solve $f(x) = 0$ with Newton's Method. It is known that $f'(x) = 0$ for some $x \in I = [x_0, x_1]$. If the root $x_\star \in I$, what is the expected rate of convergence?

- ☐ a. 2
- ☑ b. 1 or 2
- ☐ c. 1

✓ Yes!! Spot on!

Check

Your answer is correct.

You have correctly selected 1.

Correct

Marks for this submission: 1.00/1.00.

Let $\varphi(x) = x^3 + 6x^2 + x - 8$. Over what interval does the iteration converge? If it does at all, that is.

- ☐ a. $x \in [0, 1]$
- ☐ b. Trick question. It converges for all x.
- ☑ c. Trick question. It diverges for all x.

✓ I'm an open book to you.

Check

Your answer is correct.

You have correctly selected 1.

Correct

Marks for this submission: 1.00/1.00.

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 **4**

Flag question Mark 1.00 out of 1.00 Correct

Consider $\varphi(x) = \sqrt{(8 - x^3)/6}$. If it is given that the fixed point lies in $I = [1, 2]$, is it guaranteed that the iteration will converge for all initial guesses $x_0 \in I$? What about $x_0 = 1.5$ specifically?

- ☐ a. Converges for all $x \in I$.
- ☑ b. Converges over a subinterval and $x_0 = 1.5$ leads to convergence.
- ☐ c. Converges only for $x = 1$.

✓ Bingo! You nailed it!

Check

Your answer is correct.

You have correctly selected 1.

Correct

Marks for this submission: 1.00/1.00.