

1. Convert 10.25 to a binary decimal
2. In the floating point system  $0.d_1d_2d_3 \times 10^p$ ,  $p \in [-5, 5]$ , evaluate  $(500 - 0.5) - 500$ , with rounding? with chopping?
3. Find an initial interval for bisection so that it converge to the root  $x = 1$  of  $f(x) = x^3 - x$ .
4. Does the fixed point algorithm converge near the fixed point 1, of  $x_{k+1} = x_k^3$ .
5. What about  $x_{k+1} = x_k^{1/3}$ ?
6. At what rate does the fixed point method converge to  $p = f(p)$ , if  $f'(p) = 0$ ,  $f''(p) = 1$ .
7. Write newton's method
8. At what rate does newton's method converge to a point p if  $f(p) = 0$ ,  $f'(p) = 1$ ,  $f''(p) = 2$ .
9. Assuming convergence, at what rate does the secant method converge?
10. Write a formula for the point c, at which the method of false position divides an interval.
11. If  $\det(A) = 1$ , what is the solution to  $Ax = 0$ ?
12. Find the determinate of

$$A = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 1 \\ 0 & 0 & 1 \end{pmatrix}.$$

13. How does the number of floating point operations scale as a function of the matrix size, n, for Gaussian elimination
14. (T/F) All matrices can be written as a product  $A = LU$
15. (T/F) Gaussian elimination can be used to solve  $Ax = b$  for all matrices  $A$ .
16. (T/F) Pivoting should be used only when a divisor, or pivot, in gaussian elimination is equal to zero.
17. Draw the figure in the xy-plane which corresponds to  $\|v\|_\infty = 1$ , if  $v = (x, y)$ .
18. Calculate  $\|A\|_\infty$  for

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & -1 & 2 \\ 8 & -4 & 1 \end{pmatrix}$$

19. The ratio of the forward relative error to the backward relative error is bounded by what?
20. (T/F) An iterative method converges if  $\rho(M) < 1$ ?
21. (T/F) There exists matrices with  $\|M\|_\infty = 2$  and  $\|M\|_1 = 1$ ?
22. (T/F) There exists matrices with  $\rho(M) = 2$  and  $\|M\|_\infty = 1/2$ ?
23. Write the matrix-vector formula for the Jacob method.
24. (T/F) The Gauss-Seidel method converges if and only if the matrix A is strictly diagonal dominant
25. Write the matrix-vector formula for the SOR method, with the relaxation parameter  $\omega = 1$