

Calculator Training Tasks - Casio FX-991DE X

Practice Problems for Sections 1-5

Part 1: Mathematical Foundations

Problem 1.1: Fraction Calculations (x)

Use your calculator to evaluate the following expressions. Verify your answers are in simplified form.

a) $\frac{3}{4} + \frac{5}{6} - \frac{1}{2}$

b) $\frac{7}{12} \times \frac{8}{21}$

c) $2\frac{1}{3} + 1\frac{3}{4}$

d) $\frac{15}{8} \div \frac{5}{12}$

Problem 1.2: Powers and Roots (x)

Calculate the following using your calculator:

a) $3^4 + 2^5 - 5^2$

b) $\sqrt{169} + \sqrt[3]{125}$

c) $(2^3)^2 - 4^3$

d) $\sqrt[4]{256} \times \sqrt{49}$

Problem 1.3: Logarithm Evaluations (x)

Use your calculator to find:

a) $\log_{10}(100)$

b) $\ln(e^3)$

c) $\log_2(64)$

d) $\log_5(125) + \log_3(27)$

Problem 1.4: Memory and Variables (x)

Follow these steps and record each result:

a) Store the value 12.5 in variable A. Then calculate $3 \times A + 7$.

b) Calculate $\sqrt{50}$ and store the result in B. Then find B^2 .

c) If $A = 5$ and $B = 3$, use stored variables to calculate $A^2 - B^2$.

Problem 1.5: Percentage Calculations (x)

Use your calculator's percentage function to solve:

- a) What is 15% of 240?
- b) Increase 180 by 12%
- c) Decrease 500 by 8%
- d) A product costs 85€ after a 15% discount. What was the original price?

Problem 1.6: Prime Factorization (x)

Use the FACT function (SHIFT + FORMAT → Primfakt.) to find:

- a) Prime factorization of 360
- b) Prime factorization of 1260
- c) Use prime factorization to simplify $\frac{84}{126}$

Problem 1.7: GCD and LCM (x)

Use the GCD and LCM functions:

- a) Find GCD(48, 72)
- b) Find LCM(12, 18)
- c) Use GCD to simplify $\frac{144}{180}$
- d) Find the smallest number divisible by both 15 and 20

Problem 1.8: CALC Button - Formula Evaluation (x)

Use the CALC button to evaluate expressions with different variable values:

- a) Enter the quadratic formula $\frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$ and find one root of $2x^2 + 5x - 3 = 0$
- b) Enter the area formula $A = \pi r^2$ and calculate for $r = 3$, $r = 5$, and $r = 7$
- c) Evaluate $2x^2 + 3x - 5$ for $x = 1, 2, 3, 4$

Problem 1.9: Ans Button - Chain Calculations (x)

Use the Ans button to perform chain calculations:

- a) Calculate compound interest: Start with 1000€ at 5% annual interest. Use Ans to find the value after 1, 2, 3, and 4 years.
- b) Heron's method for $\sqrt{5}$: Start with guess 2, then iterate using $\frac{1}{2}\left(x + \frac{5}{x}\right)$

Part 2: Equations & Problem-Solving

Problem 2.1: Quadratic Equations (x)

Use the polynomial equation solver to find the solutions of:

- a) $x^2 - 7x + 12 = 0$
- b) $2x^2 + 5x - 3 = 0$
- c) $x^2 - 6x + 9 = 0$
- d) $x^2 + 4 = 0$ (What happens?)

Problem 2.2: Cubic Equations (xx)

Solve using the polynomial solver:

- a) $x^3 - 6x^2 + 11x - 6 = 0$
- b) $x^3 - 3x^2 - 4x + 12 = 0$

Problem 2.3: Systems of Linear Equations (x)

Use the simultaneous equation solver:

- a) $\begin{cases} 2x + 3y = 13 \\ x - y = 1 \end{cases}$
- b) $\begin{cases} 5x + 2y = 24 \\ 3x - 4y = -2 \end{cases}$
- c) $\begin{cases} x + y + z = 6 \\ 2x - y + z = 3 \\ x + 2y - z = 2 \end{cases}$

Problem 2.4: Break-Even Analysis (xx)

A company's profit function is $P(x) = -2x^2 + 40x - 150$ where x is in hundreds of units.

- a) Find the break-even points using the polynomial solver.
- b) Find the vertex of this parabola using $x_v = -\frac{b}{2a}$ and then calculate $P(x_v)$.
- c) Interpret the business meaning of both results.

Problem 2.5: Market Equilibrium (xx)

Given supply and demand functions:

- Demand: $Q_d = 200 - 4P$
- Supply: $Q_s = 50 + P$

Set up and solve the system to find equilibrium price and quantity.

Problem 2.6: SOLVE Function - Newton's Method (xx)

Use the SOLVE function (SHIFT + CALC) to find solutions numerically:

- a) Find one solution to $x^3 - 5x + 3 = 0$ (start with initial guess $x = 1$)
- b) Solve $\sin(x) = 0.5$ for x in radians (start with $x = 0.5$)

c) Find where the derivative of $f(x) = x^3 - 6x$ equals zero

Part 3: Functions

Problem 3.1: Function Evaluation (x)

Define $f(x) = 2x^2 - 3x + 1$ in your calculator and find:

- a) $f(0)$
- b) $f(2)$
- c) $f(-1)$
- d) $f(0.5)$

Problem 3.2: Value Tables (x)

Create a value table for $f(x) = x^2 - 4x$ from $x = -1$ to $x = 5$ with step 1.

- a) Record all function values.
- b) At which x -values is $f(x) = 0$?
- c) Where does $f(x)$ appear to have its minimum?

Problem 3.3: Composite Functions (xx)

Define $f(x) = 2x + 1$ and $g(x) = x^2$ in your calculator.

Calculate:

- a) $f(g(2))$
- b) $g(f(2))$
- c) $f(g(3))$
- d) $g(f(0))$

Part 4: Advanced Functions

Problem 4.1: Exponential Calculations (x)

Calculate:

- a) e^2
- b) e^{-1}
- c) $10^{2.5}$
- d) $e^{\ln(5)}$

Problem 4.2: Trigonometric Calculations (x)

Make sure your calculator is in degree mode (D indicator). Calculate:

- a) $\sin(30^\circ)$
- b) $\cos(60^\circ)$
- c) $\tan(45^\circ)$
- d) $\sin^{-1}(0.5)$ (What angle has sine = 0.5?)

Problem 4.3: Angle Conversions (x)

- a) Convert 45° to radians.
- b) Convert $\frac{\pi}{3}$ radians to degrees.
- c) Calculate $\sin\left(\frac{\pi}{6}\right)$ (make sure to use radian mode or convert).

Part 5: Differential Calculus

Problem 5.1: Numerical Derivatives (x)

For $f(x) = x^2 - 4x + 3$, use the calculator's derivative function to find:

- a) $f'(0)$
- b) $f'(2)$
- c) $f'(4)$
- d) At what value of x is $f'(x) = 0$?

Problem 5.2: Verifying Critical Points (xx)

For $f(x) = x^3 - 6x^2 + 9x$:

- a) Find $f'(1)$ and $f'(3)$ using your calculator.
- b) Are $x = 1$ and $x = 3$ critical points? How do you know?
- c) Use the polynomial solver to verify by solving $f'(x) = 3x^2 - 12x + 9 = 0$.

Problem 5.3: Second Derivative and Concavity (xx)

For $f(x) = x^3 - 3x^2$:

- a) Find $f'(x)$ manually: it should be $3x^2 - 6x$.
- b) Use the calculator to verify: calculate $f'(0)$, $f'(1)$, $f'(2)$.
- c) Now calculate $f''(1)$ by finding the derivative of $f'(x) = 3x^2 - 6x$ at $x = 1$.
- d) Is $x = 1$ a local maximum or minimum? (Check sign of $f''(1)$)

Problem 5.4: Rate of Change (xx)

Revenue as a function of time is given by $R(t) = -t^2 + 20t + 100$ (in thousands of euros).

- a) Find the rate of change of revenue at $t = 5$ months.

- b) At what time is revenue changing at a rate of zero?
- c) Is revenue increasing or decreasing at $t = 15$? By how much?

Problem 5.5: Tangent Line Verification (xxx)

For $f(x) = x^3$ at the point $(2, 8)$:

- a) Find $f'(2)$ using the calculator.
- b) The tangent line at this point is $y = 12x - 16$. Verify this by checking that:
- The slope equals $f'(2)$
 - The line passes through $(2, 8)$

Problem 5.6: Comprehensive Optimization (xxx)

A company's profit function is $P(x) = -0.25x^2 + 15x - 80$ where x is units in hundreds.

Use your calculator to find:

- a) The break-even points (use polynomial solver for $P(x) = 0$)
- b) The rate of change of profit at $x = 20$
- c) The production level that maximizes profit (where $P'(x) = 0$)
- d) The maximum profit