Sample

November 22, 2025

1 Preamble / Introduction

Basic Advanced Functions — Part 1: Communication Problems Your Name October 28, 2025

Question~**??** (6 points)

Rewrite each relationship using function notation. All given text retained; one "=" per line; equals aligned. a) An airplane must travel 400 km. Let t be the travel time (in hours) and let s(t) denote the speed (in km/h). Speed = Distance Time (t > 0, km/h) s(t) = 400 t b) An ice cream cone starts at 125 mL and loses half its volume every 5 min. Let t be in minutes and v(t) be the volume (mL); the discrete half-life model is v(t) = v0

1 2 t/T1/2 t/5 v(t) = 125

1 2 c) Scott drives at a constant speed of 50 km/h. If d(t) is the distance (km) after t hours, d(t) = 50t

Question~**??** (6 points)

Formatting: parts (a) and (b) are side by side with a clean divider; all "=" signs aligned inside each block. 1 a) p(r) = 2r2 + 2r -1 b) 3y + 5x = 18 x = 2y2 + 2y -1 3y + 5x = 18 x + 1 = 2 y2 + y

3y = -5x + 18 x + 1 = 2

y + 1

2 -1 y = -5 3x + 6 2 4 x = -5 2 -1 x + 1 = 2

y + 1 3y + 6 2 2 x -6 = -5 2 = 2

y + 1 2 3y x + 3 2 y = -3 5(x -6) x 2 + 3 2 4 =

$y + 1\ 5x + 18\ y = -3\ 2\ 5\ 2 = \pm q y + 1 x 2 + 3 f - 1(x) = -35x + 18452 \pm q x 2 + 3y = -142 \pm q p - 1(x) = -1x2 + 34c)h(t) = -4.9(t + 3)2 + 45.8x = -4.9(y + 3)2 + 45.8x - 45.8 = -4.9(y + 3)245.8 - x = 4.9(y+3)245.8 - x4.9 = (y+3)2r45.8 - x y + 3 = \pm 4.9r45.8 - x y = -3 \pm 4.9r45.8 - x h - 1(x) = -3 \pm 4.92$

Using graphs, decide whether each inverse is a function. Figures are side by side (uniform size) with concise captions. Below each pair, the reasoning lines up the "$\Rightarrow$" $arrows and the verdict is boxed. a) p - 1 i Inverse (reflection across y = x). ii Vertical line test : fails. Construct inverse : reflect graph of y = p(x) across y = x of p - 1 Apply VLT to p - 1 : some vertical scut the graph twice \Rightarrow Inverse is not a function Domain/Range swap : Dom(p - 1) = Ran(p), Ran(p - 1) = Dom(p) b) f - 1 i Inverse of a line (reflection across y = x). ii Vertical line test : passes. Construct inverse : reflect non-vertical line across y = x non-vertical line Apply VLT to f - 1 : each vertical meets at most once \Rightarrow Inverse is a function Domain/Range swap : Dom(f - 1) = Ran(f), Ran(f - 1) = Dom(f) 3 c) h - 1 Construct inverse : reflect graph of y = h(x) across y = x h - 1 Apply VLT to h - 1 : fails (some vertical scut twice) \Rightarrow Inverse is not a function Domain/Range swap : Dom(h - 1) = Ran(h), Ran(h - 1) = Dom(h)$

All original answers preserved. Reformatted into three readable "summary cards" (no clipping; full-size math). (a) f(x) = 2x2 -8 4 Domain & Domain : x   Range Range : y | y $\geq -8 Restrictions Domain : None Range : y \geq -8 Increasing/De-Decreasing : (-\infty, 0) creasing Increasing : (0, +\infty) x - intercepts \Rightarrow (2, 0), (-2, 0) f(x) = 0 (roots) 0 = 2x2 - 8 8 2 = x2 x = \pm 2 F(0) = 2(0)2 - 8 y - intercepts \Rightarrow (0, -8) (x = 0) = -8 Vertex/Notes x = -b \Rightarrow (0, -8) 2a = -0 2 \cdot 2 = 0 y = 2(0)2 - 8 = -8 (b) f(x) = +\sqrt{x} - 2 Domain & Domain : x | x \geq 2 Range Range : y | y \geq 0 Restrictions Domain : x \geq 2 Range : y \geq 0 Increasing/De-Decreasing : N/A creasing Increasing : [2, +\infty) x - intercepts f(x) = 0 \Rightarrow (2, 0) 0 = +\sqrt{} (roots) x - 2 x = 2 F(0) = +\sqrt{} y - intercepts 0 - 2/A (none) (x = 0) Vertex/Notes No vertices. 5 (c) f(x) = (x + 1)(x - 1) Domain : x | x = 1 Range : y | y = 1 Restrictions Domain : x = 1 Range : y = 1 Decreasing : (-\infty, 1) \cup (1, +\infty) Increasing : N/A \Rightarrow (-1, 0) 0 = x + 1 x - 1 x = -1 F(0) = 0 + 1 \Rightarrow (0, -1) 0 - 1 = -1$

The point (1, -2) is on the graph of f. Describe the following transformations on f, and determine the resulting point. We use g(x) = a f k(x -d) + c, x' = x k + d, y' = a y + c. a) g(x) = 2f(x) + 3 The a = 2 indicates a vertical stretch by a factor of 2 and the c = 3 indicates a vertical translation of 3 units up. x' = x k + d = 1 1 + 0 = 1 y' = a y + c = 2(-2) + 3 = -1 Therefore, the resulting point is (1, -1) . 6 b) g(x) = f(x + 1) -3 The d = -1 (since x -d = x -(-1) = x + 1) indicates a horizontal translation of 1 unit to the left and the c = -3 indicates a vertical translation of 3 units down. x' = x 1 + (-1) = 0 = 1(-2) + (-3) = -5 Therefore, the resulting point is (0, -5) . c) g(x) = -f(2x) The a = -1 indicates a reflection in the x-axis and the k = 2 indicates a horizontal compression by a factor of 1/2. x' = x 2 + 0 2 = (-1)(-2) + 0 = 2 2, 2 . Therefore, the resulting point is 1 7 d) g(x) = -f(-x -1) + 3 The a = -1 indicates a reflection in the x-axis, the k = -1 indicates a reflection in the y-axis, the d = -1 (from x -d = x -(-1) = x + 1) indicates a horizontal translation of 1 unit to the left, and the c = 3 indicates a vertical translation of 3 units up. k + d = 1 -1 + (-1) = -2 y' = a y + c = (-1)(-2) + 3 = 5 Therefore, the resulting point is (-2, 5) . 8