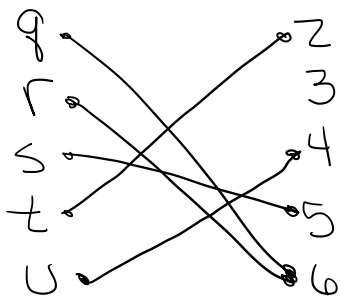
Section 2 Assignment (77 points)- Functions

To receive credit, you must either show your work on the worksheet or explain how you got the answer.

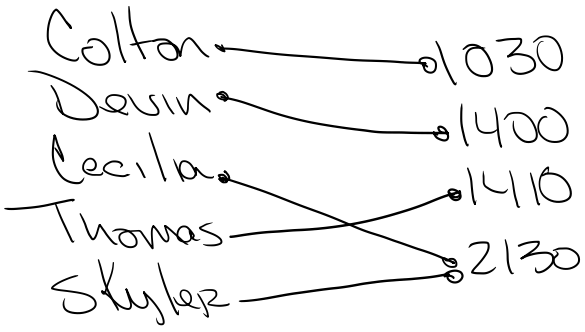
1. (16 points) Draw an arrow diagram for each of the following functions AND give the range of the function using set notation.

   a. (3 pts) Let A = {q, r, s, t, u} and let B = {2, 3, 4, 5, 6}.
   f: A → B is defined as f = {(t, 2), (s, 5), (q, 6), (r, 6), (u, 4)}



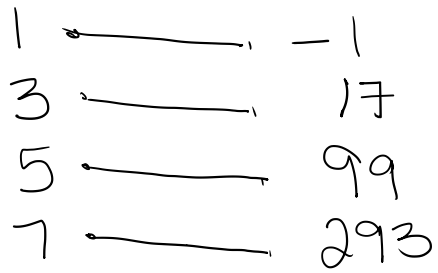
range = {2, 4, 5, 6}

   b. (3 pts) Let S = {Colton, Devin, Cecilia, Thomas, Skyler} and C = {1030, 1400, 1410, 2130} and g: S → C is defined as g = {(Cecilia, 2130), (Devin, 1400), (Skyler, 2130), (Colton, 1030), (Thomas, 1410)}



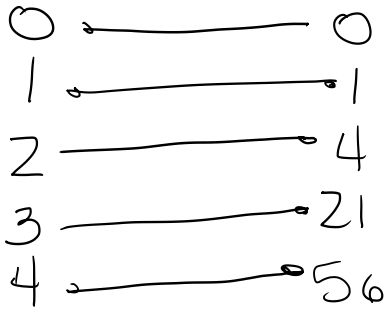
Range = {1030, 1400, 1410, 2130}

   c. (5 pts) Let B = {1, 3, 5, 7}. f: B → Z such that $f(b) = b^3 - b^2 - 1$



Range = {−1, 17, 99, 293}

d. (5 pts) Let D = {0, 1, 2, 3, 4}. i: D → Z such that $f(d) = |2d - d^3|$



Range = {0, 1, 4, 21, 56}

2. (8 points) Give the floor (F) and ceiling (C) for each item.

   a. (2 pts) -15.001

   F = -16 C = -15

   b. (2 pts) -9.98

   F = -10 C = -9

   c. (2 pts) 14.325

   F = 14 C = 15

   d. (2 pts) 10.981

   F = 10 C = 11

3. (12 points) Are the following functions one-to-one(injective), onto(surjective), both(bijective) or neither?

   a. (3 pts) Given A = {q, r, s, t, u}, B = {2, 3, 4, 5, 6}
   and f: A → B where f = {(t, 2), (s, 5), (q, 6), (r, 6), (u, 4)}

   not one-to-one
   not onto

   b. (3 pts) Given S = {Aaron, Peyton, Ryan, Matthew, Madison, Jasim}, C = {1030, 1400, 1410, 2130, 2420}
   and g: S → C where g = {(Aaron, 2130), (Jasim, 1400), (Matthew, 2130), (Peyton, 2420), (Ryan, 1410), (Madison, 1030)}

   not one-to one
   onto

   c. (3 pts) Given B = {1, 3, 5, 7}. b: B → Z such that $f(b) = b^3 - b^2 - 1$

   one-to-one
   not onto

d. (3 pts) Given C = {q, r, s, t, u, v, w}, D = {2, 4, 6, 8, 10, 12, 14}
and g: C → D where g = {(t, 2), (s, 4), (q, 6), (w, 8), (u, 10), (r, 12), (v, 14)}

both

4. (6 points) What is the domain, target(codomain), and range of f?
   a. (3 pts) Given A = {1, 3, 5, 7, 9}, B = {-1, 0, 1} let f: A → B be defined as
   f = {(5, 1), (3, 1), (1, 1), (9, 1), (7, 0)}

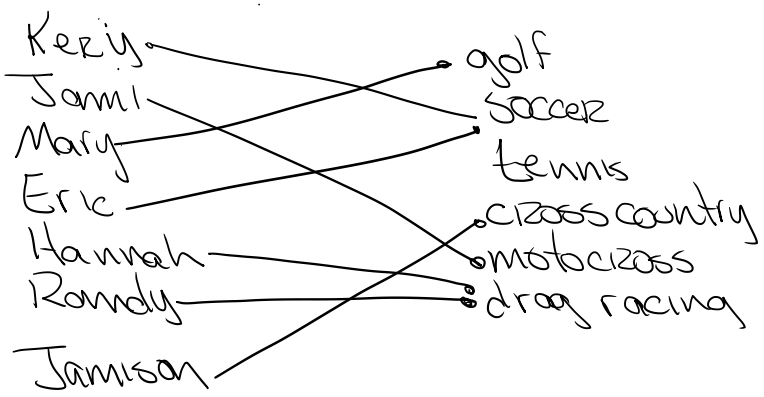
domain = {1, 3, 5, 7, 9}
codomain = {-1, 0, 1} range = {0, 1}

   b. (3 pts) Given C = {0, 1, 2, 3, 4} let g: C → Z^+ such that g(c) = 2^c

domain = {0, 1, 2, 3, 4}
codomain = Z^+ range = {1, 2, 4, 8, 16}

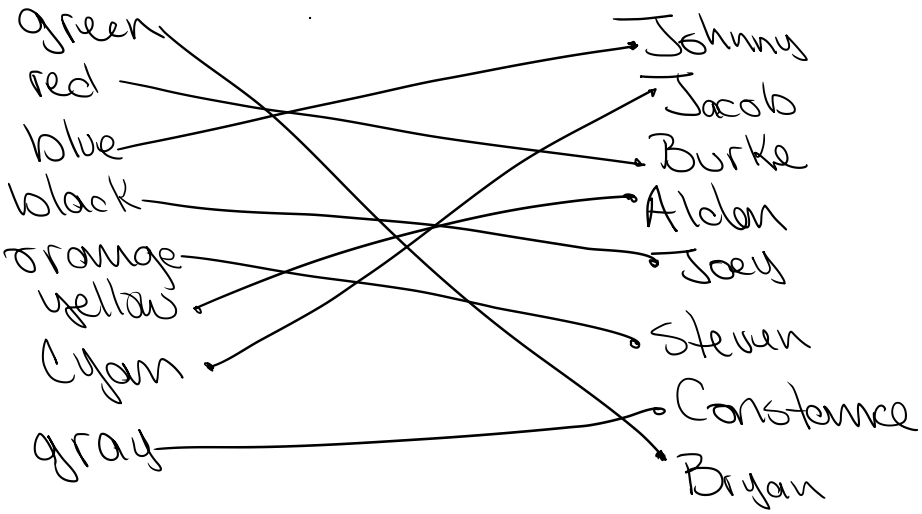
5. (10 points) Each of the arrow diagrams below define a function f. For each arrow diagram, indicate whether f^{-1} is well-defined.
   - If f^{-1} is not well-defined, indicate why
   - If f^{-1} is well-defined, give an arrow diagram showing f^{-1}

   a. (5 pts)

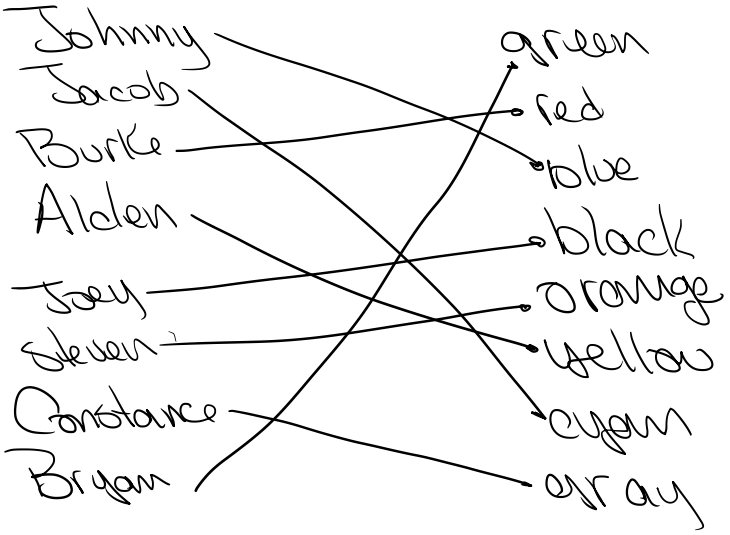


f^{-1} is not well-defined

b. (5 pts)



f^{-1} is well-defined



6. (25 points) Composition of Functions.
   Let A = B = $\mathbb{R}$, $f(a) = a^3 - a^2 - a$ and $g(b) = |2b - b^3|$

   a. (5 pts) $(g \circ f)(-2)$

   980

   b. (5 pts) $(g \circ f)(2)$

   $= 4$

   c. (5 pts) $(f \circ g)(1)$

   $= -1$

   d. (5 pts) $(f \circ f)(3)$

   3135

   e. (5 pts) $(g \circ g)(-4)$

   $= 175,504$