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Worksheet 8 • Restriction of Domain

1. Sketch the graph the function $f(x) = (x + 1)^2$ and then reflect f about the line $y = x$. (Comment: When you reflect f about the line $y = x$, you interchange the roles of the x and y coordinates.) Is the reflection of f a function?
2. Restrict the domain of f given by $f(x) = (x + 1)^2$ in the simplest way possible so that f becomes invertible on that domain and the range of the inverse is an interval containing zero.
3. Let C be the function that projects the unit circle, \mathcal{C} , onto the x -axis. This is the function

$$C: \mathcal{C} \rightarrow [-1, 1] \quad \text{defined by} \quad C(a, b) = a.$$

Is this function invertible? If not, find the largest arc, \mathcal{A} , on the circle and containing $(0, 1)$ where it is invertible. You should highlight this arc \mathcal{A} .

4. Let S be the function that projects the unit circle, \mathcal{C} , onto the y -axis. This is the function

$$S: \mathcal{C} \rightarrow [-1, 1] \quad \text{defined by} \quad S(a, b) = b.$$

Is this function invertible? If not, find the largest arc, \mathcal{B} , on the circle and containing $(1, 0)$ where it is invertible. You should highlight this arc \mathcal{B} .

5. Denote respectively by C^{-1} and S^{-1} the inverse of the restriction of C on \mathcal{A} and the inverse of the restriction of S on \mathcal{B} . Calculate

$$C^{-1}\left(\frac{1}{3}\right), \quad C^{-1}\left(-\frac{1}{3}\right), \quad S^{-1}\left(\frac{2}{3}\right), \quad \text{and} \quad S^{-1}\left(-\frac{2}{3}\right).$$

6. Calculate

- (a) $C^{-1}\left(C\left(\frac{2}{5}, \frac{\sqrt{21}}{5}\right)\right)$
- (b) $C^{-1}\left(C\left(\frac{2}{5}, -\frac{\sqrt{21}}{5}\right)\right)$
- (c) $S^{-1}\left(S\left(\frac{2}{5}, \frac{\sqrt{21}}{5}\right)\right)$
- (d) $S^{-1}\left(S\left(-\frac{2}{5}, \frac{\sqrt{21}}{5}\right)\right)$.
- (e) $S^{-1}\left(C\left(\frac{2}{5}, \frac{\sqrt{21}}{5}\right)\right)$
- (f) $S^{-1}\left(C\left(\frac{2}{5}, -\frac{\sqrt{21}}{5}\right)\right)$
- (g) $C^{-1}\left(S\left(\frac{2}{5}, \frac{\sqrt{21}}{5}\right)\right)$
- (h) $C^{-1}\left(S\left(-\frac{2}{5}, \frac{\sqrt{21}}{5}\right)\right)$.