Rocketship Function Transformation

Nickname, Class, and Student Number: _____
Date: _____

Instructions:

For each part of the rocketship below:

1. Identify the parent function given.
2. Write the transformations applied (shifts, reflections, stretches/compressions).
3. Write the transformed function's equation.
4. Indicate the domain or range restriction if given.
5. Plot the function on your graph paper carefully.

Part 1: Nose Cone

- **Parent function:** y=_____
- **Transformations:**
    - Reflection: _____
    - Vertical stretch/compression by factor: _____
    - Vertical shift (up/down) by: _____ units
- **Equation:**

y=_____

- **Domain restriction:**

x∈[_____,_____]

Part 2: Rocket Body (Sides)

- The rocket body consists of two vertical lines.
- Write the equations for these lines:

x=_____ and x=_____

- **Range restriction for y:**

y∈[_____,_____]

Part 3: Side Fins

- **Parent function:** y=_____
- **Transformations for left fin:**
  - Reflection: _____
  - Vertical stretch/compression factor: _____
  - Horizontal shift: _____ units (left/right)
  - Vertical shift: _____ units (up/down)
- **Equation for left fin:**

y=_____

- **Domain restriction for left fin:**

x∈[_____,_____]

- Repeat the same for the right fin:
  - Horizontal shift: _____ units (left/right)
  - Equation:

y=_____

Domain restriction:

x∈[_____,_____]

Part 4: Window (Circle)

- The window is part of a circle with radius: _____
- Center of the circle: (___,___)
- Equation of the circle:

$(x-\_\_\_)^2+(y-\_\_\_)^2=\_\_\_\_\_$

- Solve for y to find the top half:

$y=\_\_\_\_\_+\_\_\_\_\_$

- And the bottom half:

$y=\_\_\_\_\_+\_\_\_\_\_$

- **Domain restriction:**

$x\in[\_\_\_\_\_,\_\_\_\_\_]$

Part 5: Exhaust Flames

- **Parent function:** $y=\_\_\_\_\_$
- **Transformations:**
  - Reflection: _____
  - Horizontal stretch/compression by factor: _____
  - Vertical shift (up/down) by: _____ units
- **Equation:**

$y=\_\_\_\_\_$

Domain restriction:

$x\in[\_\_\_\_\_,\_\_\_\_\_]$

Bonus Challenge (Optional):

- Color-code each function type on your graph.
- Label each part clearly.
- Add any extra details or decorations you like!

Rocketship Function Transformation Worksheet — Answer Key

Part 1: Nose Cone

- **Parent function:** $y=x^2$
- **Transformations:**
    - Reflection: over the x-axis (reflect downward)
    - Vertical stretch/compression by factor: 2 (stretch)
    - Vertical shift (up/down) by: 8 units (up)
- **Equation:**

$y=-2x^2+8$

- **Domain restriction:**

$x\in[-2,2]$

Part 2: Rocket Body (Sides)

- The rocket body consists of two vertical lines.
- Write the equations for these lines:

$x=-2$ and $x=2$

- **Range restriction for y:**

$y\in[-4,8]$

Part 3: Side Fins

- **Parent function:** $y=|x|$
- **Transformations for left fin:**
    - Reflection: over the x-axis (reflect downward)
    - Vertical stretch/compression factor: 0.5 (compression)
    - Horizontal shift: 2 units left

    - Vertical shift: 1 unit down

- **Equation for left fin:**

$y=-0.5|x+2|-1$

- **Domain restriction for left fin:**

$x\in[-4,-2]$

- For the right fin:
    - Horizontal shift: 2 units right
    - Equation:

$y=-0.5|x-2|-1$

    - Domain restriction:

$x\in[2,4]$

Part 4: Window (Circle)

- The window is part of a circle with radius: 1
- Center of the circle: (0,4)
- Equation of the circle:

$(x-0)^2+(y-4)^2=1$

- Solve for y to find the top half:

$y = \sqrt{1 - x^2} + 4$

- And the bottom half:
- $y = -\sqrt{1 - x^2} + 4$
- **Domain restriction:**

$x\in[-1,1]$

Part 5: Exhaust Flames

- **Parent function:** y=sin(x)
- **Transformations:**
    - Reflection: over the x-axis (reflect downward)
    - Horizontal stretch/compression by factor: π2\frac{\pi}{2}2π inside the sine function (horizontal compression)
    - Vertical shift (up/down) by: 4 units down
- **Equation:**

$y=-\sin(\frac{\pi}{2}x)-4$

- **Domain restriction:**

$x\in[-2,2]$