Solutions

2.1 Radical Equations and Extraneous Solutions

2.1.1. Solve $\sqrt{x+1}=3$.

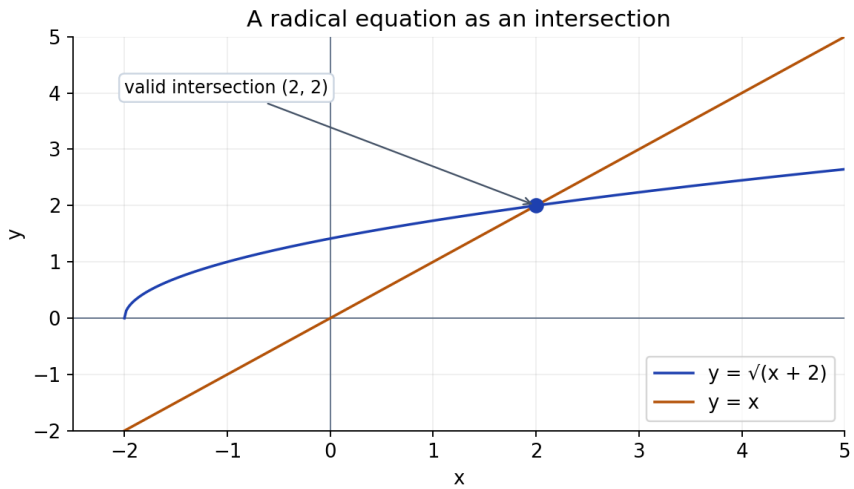
Solution. $x+1=9$, hence $x=8$, which checks.

2.1.2. Solve $\sqrt{x}=x-2$.

Solution. Require $x\geq 2$. Squaring gives $x^2-5x+4=0$, so candidates are 1 and 4. Only $x=4$ satisfies the original.

2.1.3. Use the graphs of $y=\sqrt{x+2}$ and $y=x$ to solve $\sqrt{x+2}=x$.

Solution. Squaring gives $(x-2)(x+1)=0$. The radical is nonnegative, so $x=-1$ fails. The valid intersection is $(2,2)$.



The intersection is (2, 2); the squared-equation candidate −1 is extraneous.

Solutions

2.2 Asymptotes and Holes

2.2.1. Simplify $(x^2-4)/(x-2)$ and state the hole.

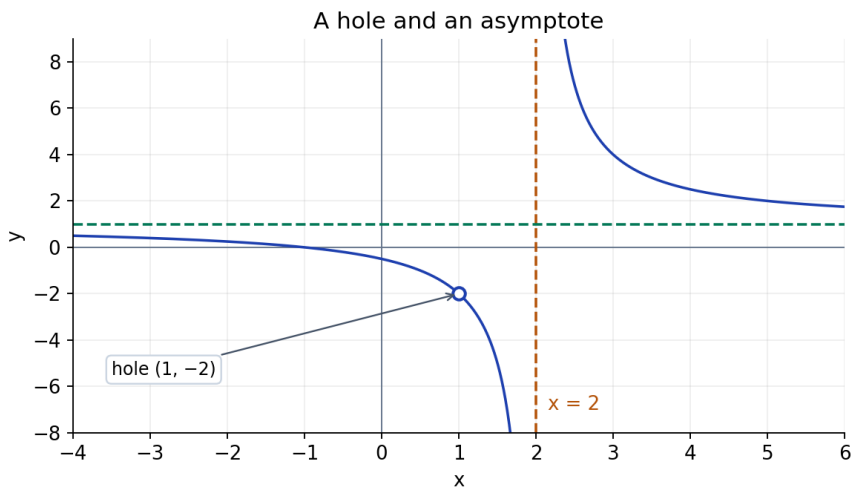
Solution. The reduced expression is $x+2$, with $x \neq 2$. The hole is $(2,4)$.

2.2.2. Find the excluded input and vertical asymptote of $1/(x+3)$.

Solution. $x=-3$ is excluded and is a vertical asymptote.

2.2.3. For the graphed function $f(x)=(x^2-1)/((x-1)(x-2))$, state the hole and vertical asymptote.

Solution. Reducing gives $(x+1)/(x-2)$, with $x \neq 1, 2$. The hole is $(1, -2)$ and the vertical asymptote is $x=2$.



The hole is (1, −2); the vertical asymptote is x = 2.

Solutions

2.3 End Behavior of Rational Functions

2.3.1. Find the horizontal asymptote of $(2x+1)/(x^2+4)$.

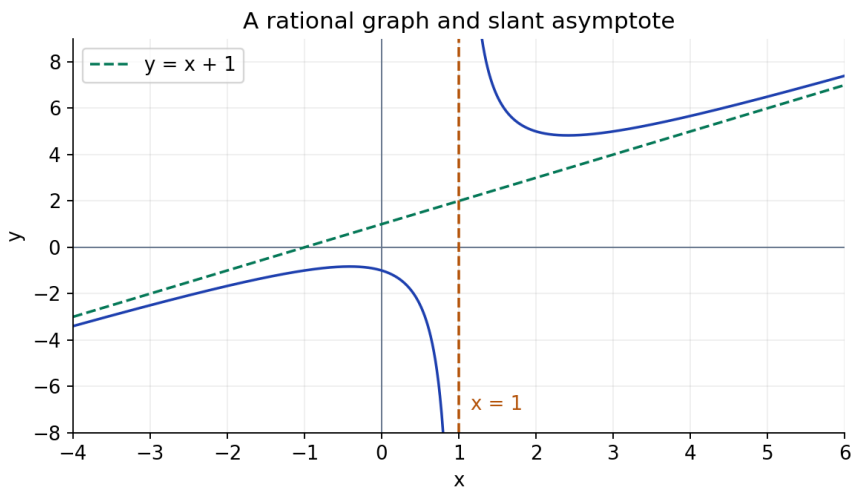
Solution. The numerator degree is smaller, so the horizontal asymptote is $y=0$.

2.3.2. Find the horizontal asymptote of $(5x^3-1)/(2x^3+x)$.

Solution. Equal degrees give $y=5/2$.

2.3.3. Use the graph of $y=(x^2+1)/(x-1)$ to identify its slant and vertical asymptotes.

Solution. Division gives $y=x+1+2/(x-1)$. The slant asymptote is $y=x+1$; the vertical asymptote is $x=1$.



The asymptotes are x = 1 and y = x + 1.