

- (2) 2. Complete the boxes: From Section **9.2**, we know the **long-run** behavior of an m th degree *polynomial* function such as $p(x) = ax^m + \text{remaining terms}$ has the same long-run behavior as the power function with the equation $y = \boxed{}$, and from Section **9.4**, the **long-run** behavior of a *rational* function such as $r(x) = \frac{ax^m + \text{remaining terms}}{bx^n + \text{remaining terms}}$ has the same long-run behavior as the power function with the equation $y = \boxed{}$.

This is because a rational function is the ratio of two polynomial functions.

- (1) 3. In the long run, the graph of $r(x) = \frac{x+3}{x+2}$ looks like the graph of the power function with the equation $y = \boxed{}$
- (2) 4. In the long run, the graph of $g(x) = \frac{3x+1}{x^2+x-2}$ looks like that of the power function with the equation $y = \frac{\boxed{}}{x}$ which approaches the number $\underline{\hspace{1cm}}$ as x gets larger and larger.

BONUS (+5)

5. It is important to know the **long-run** behavior of *power* functions that were introduced in Section **9.1**. Choose from **A** through **L**. Some choices may be used more than once. Some may not be used at all. TIP: You need to know the general shape of power functions, but in case you don't have these down yet, use your grapher. Remember to keep in mind how multiplying by a negative or positive constant changes the shape of the graph.

i. As $x \rightarrow -\infty$, then $y \rightarrow -\infty$ and as $x \rightarrow \infty$, then $y \rightarrow -\infty$.

ii. As $x \rightarrow -\infty$, then $y \rightarrow -\infty$ and as $x \rightarrow \infty$, then $y \rightarrow \infty$.

iii. As $x \rightarrow -\infty$, then $y \rightarrow 0$ and as $x \rightarrow \infty$, then $y \rightarrow 0$.

iv. As $x \rightarrow -\infty$, then $y \rightarrow \infty$ and as $x \rightarrow \infty$, then $y \rightarrow -\infty$.

v. As $x \rightarrow -\infty$, then $y \rightarrow \infty$ and as $x \rightarrow \infty$, then $y \rightarrow \infty$.

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|----------------|-----------------|--------------------|
| A. $y = 2x^2$ | E. $y = 2/x^2$ | I. $y = 2x^{1/2}$ |
| B. $y = -2x^2$ | F. $y = -2/x^2$ | J. $y = -2x^{1/2}$ |
| C. $y = 2x^3$ | G. $y = 2/x^3$ | K. $y = 2x^{1/3}$ |
| D. $y = -2x^3$ | H. $y = -2/x^3$ | L. $y = -2x^{1/3}$ |