Who is Your (Big) Daddy?

BIG DADDY

1. Suppose $f(w)=\sum_{n=0}^{\infty} w^n = 1+w+w^2+w^3+w^4+w^5+w^6+w^7+w^8+w^9+w^{10}+w^{11}+w^{12}+w^{13}+w^{14}+w^{15}+\dots$

a. If $w=-1$, then $f(-1)=\sum_{n=0}^{\infty}(-1)^n = 1+\square+\square+\square+\square+\dots = \square$ Write an exact answer, $\infty, -\infty$, or DNE

If $w=1$, then $f(1)=\sum_{n=0}^{\infty}(1)^n = 1+\square+\square+\square+\square+\dots = \square$ Write an exact answer, $\infty, -\infty$, or DNE

b. We have $f(w)=\sum_{n=0}^{\infty} w^n = 1+w+w^2+w^3+w^4+\dots$ converges to the function $g(w)=\frac{1}{\square}$ for $\square < w < \square$

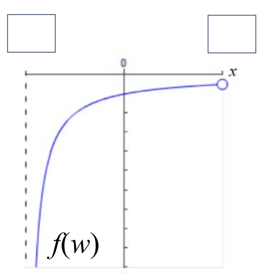
because ____

c. Pick the best answer: The interval reported in part **b** is called the ***interval*** of ____________________
{ convergence, conviction, confluence, concupiscence, concubinage, conception, conveyorization, confederation, constitution }

d. Sketch the interval reported in part **b** on a number line: ←——0——→

e. Which of the following is the graph of $f(w)=\sum_{n=0}^{\infty} w^n = 1+w+w^2+w^3+w^4+\dots$ over the interval in part **b**?

Use part **a** (and not a grapher). Circle your selection and enter numbers in the boxes for the choice you circled. The dashed line is a vertical asymptote.

A.


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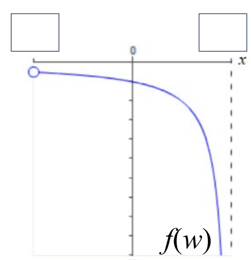

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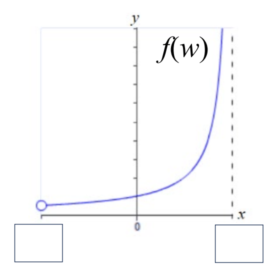

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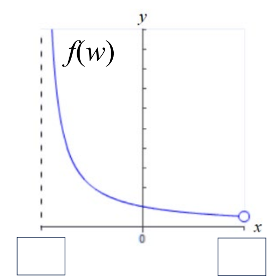

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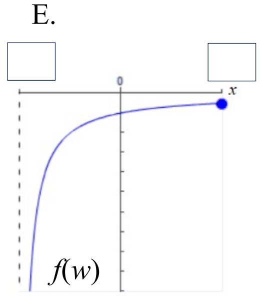

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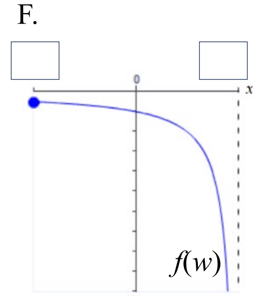

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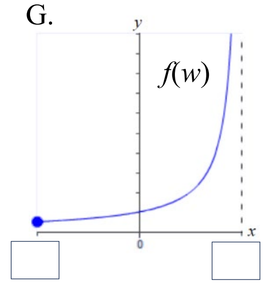

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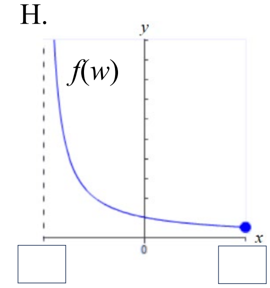


f. The ***center*** of the interval in part **b** is $w=$ ______ . The ***radius*** of ____________________ is $R=\square$.
{same answer in part c}

2. Discuss the relationship between the graph of $f(w)$ in part **e** and your answers to part **1a**.

Discuss the relationship between $f(w)$, graphed in part **e** and $g(w)=\frac{1}{\square}$. What is the same? What is different?

3. Suppose $a(x) = \sum_{n=0}^{\infty} -100\left(\frac{x-20}{5}\right)^n = -100 - 100\left(\frac{x-20}{5}\right) - 100\left(\frac{x-20}{5}\right)^2 - 100\left(\frac{x-20}{5}\right)^3 - 100\left(\frac{x-20}{5}\right)^4 - \ldots$

a. Report the interval of convergence. Show work.

$\square < x < \square$

b. The ***center*** of the interval of convergence is $x =$ ______ . The ***radius*** of convergence is $R = \square$.

c. If $x = \square$, at the **left** endpoint of the interval of convergence, then

$a(\square) = \sum_{n=0}^{\infty} -100(\square)^n = -100 + \square - \square + \square - \square + \ldots = \square$ Write an exact answer, $\infty, -\infty$, or DNE

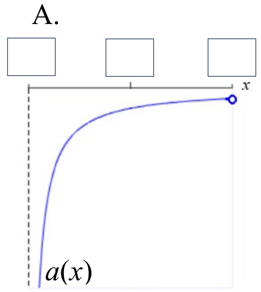
If $x = \square$, at the **right** endpoint of the interval of convergence, then

$a(\square) = \sum_{n=0}^{\infty} -100(\square)^n = -100 - \square - \square - \square - \square - \ldots = \square$ Write an exact answer, $\infty, -\infty$, or DNE

d. Which of the following is equivalent to $a(x) = \sum_{n=0}^{\infty} -100(\frac{x-20}{5})^n = -100 - 100(\frac{x-20}{5}) - 100(\frac{x-20}{5})^2 - 100(\frac{x-20}{5})^3 - \ldots$ on its interval of convergence? Select one.

A. $\frac{500}{25-x}$ B. $\frac{500}{25+x}$ C. $\frac{500}{x-25}$ D. $\frac{100}{25-x}$ E. $\frac{100}{25+x}$ F. $\frac{100}{x-25}$ G. $\frac{500}{15-x}$ H. $\frac{500}{15+x}$ I. $\frac{500}{x-15}$

e. Which of the following is the graph of $a(x) = \sum_{n=0}^{\infty} -100(\frac{x-20}{5})^n = -100 - 100(\frac{x-20}{5}) - 100(\frac{x-20}{5})^2 - 100(\frac{x-20}{5})^3 - \ldots$ on its interval of convergence? The dashed line is a vertical asymptote.
Circle your selection and enter numbers in the boxes (from parts **3ab**) for the choice you circled.

A.


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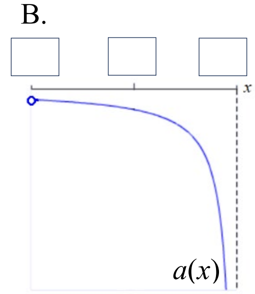

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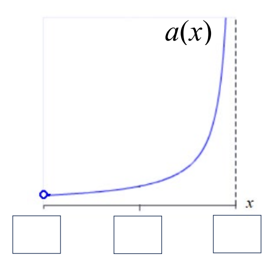

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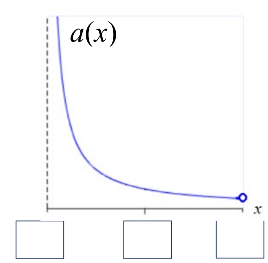

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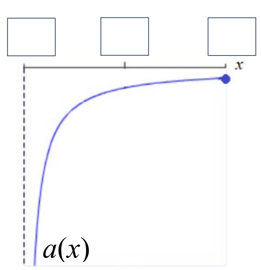

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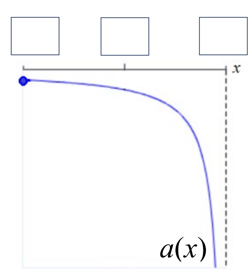

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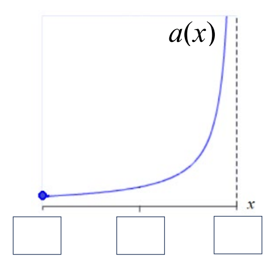

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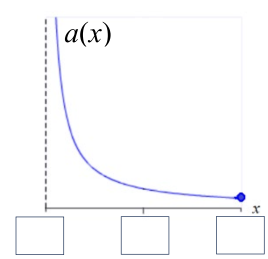

4. Discuss the relationship between the graph of $a(x)$ in part **3e** and the graph of its father function, $f(w)$, shown in part **1e**. What is the same? What is different?