

2. [16 points] The five parts of this question are **unrelated** to each other.

- a. [3 points]  $f(x)$  is a periodic function with domain  $(-\infty, \infty)$ , with a period of 5, with an amplitude of 2, and with midline  $y = -1$ . Find the amplitude, period and midline of  $g(x) = -7f(2(x - 3)) + 1$ .

The period of  $g(x)$  is \_\_\_\_\_.

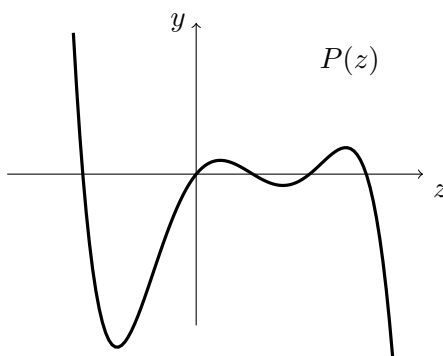
The amplitude of  $g(x)$  is \_\_\_\_\_.

The midline of  $g(x)$  is \_\_\_\_\_.

- b. [2 points] Let  $a, b, c > 0$  be positive constants. Evaluate the following limit. You do not need to show any work for this part.

$$\lim_{x \rightarrow \infty} \frac{(\sqrt{x} + 2)^6}{ax^3 + bx + c} = \underline{\hspace{2cm}}$$

- c. [3 points] The graph of a polynomial  $y = P(z)$  **with its end behavior shown** is graphed below. Answer the following questions about  $P(z)$ .



Is the degree of  $P(z)$  even or odd?

even                  odd                  not possible to tell

Is the leading coefficient of  $P(z)$  positive or negative?

positive                  negative                  not possible to tell

What is the smallest possible degree of  $P(z)$ ?

The smallest possible degree of  $P(z)$  is \_\_\_\_\_.

**2. (continued)** Reminder: The parts of this question are **unrelated** to each other.

d. [3 points] The table below give some values of a function  $M(t)$  at different  $t$ -values.

|        |     |     |      |
|--------|-----|-----|------|
| $t$    | 0   | 3   | 5    |
| $M(t)$ | 625 | 900 | 1296 |

What type of function could  $M(t)$  be? Circle all that apply.

linear     
  exponential     
  quadratic     
  none of these

Could  $M(t)$  be proportional to  $t^2$ ?

yes     
  no

If you answered no, briefly explain why not, and if you answered yes, find the constant of proportionality.

e. [5 points] Consider the function,  $H(t) = 3e^{1.2t-3}$ , that gives the weight, in grams of a mealworm  $t$  days after it hatches. Find the weight of a mealworm when it hatches, find the daily (non-continuous) growth rate of  $H(t)$ , and find the amount of time it takes for a mealworm to triple in weight, all in **exact form**, with **appropriate units**. Be sure to show **all** your work.

The weight when it hatches is \_\_\_\_\_.

The daily (not continuous) growth rate is \_\_\_\_\_.

The time it takes to triple in weight is \_\_\_\_\_.