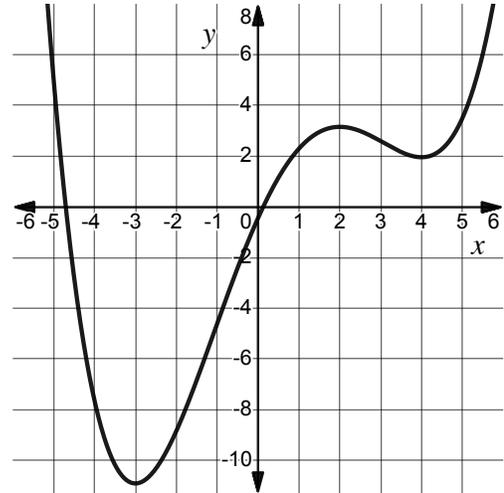
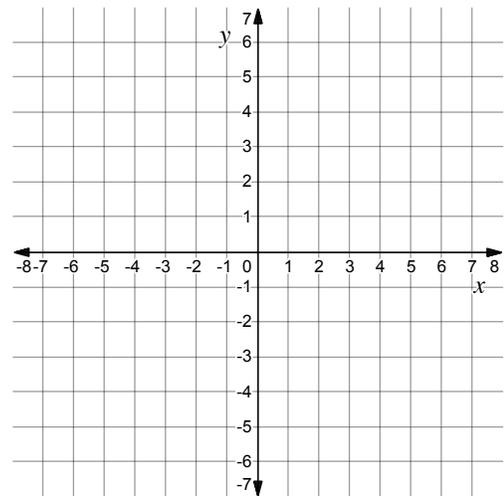


HW Lesson 1.2

1. The graph of $y = f(x)$ is shown. Identify the intervals on which f is increasing, decreasing, and constant.

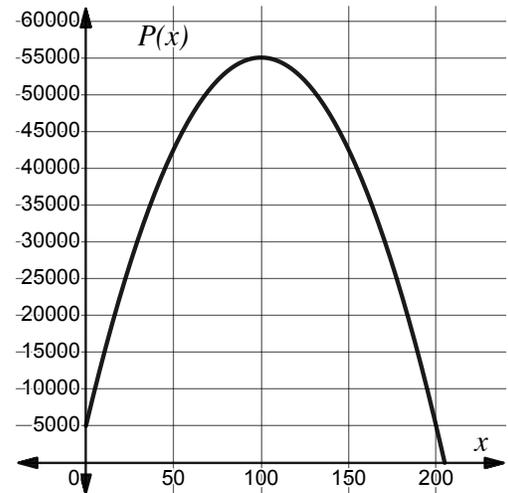


2. Sketch the graph of a function f that meets the following criteria:
- f has a domain of all real numbers
 - f is constant for $-5 \leq x \leq 0$
 - f is increasing for $0 \leq x \leq 2$
 - f has a maximum value at $x = 2$



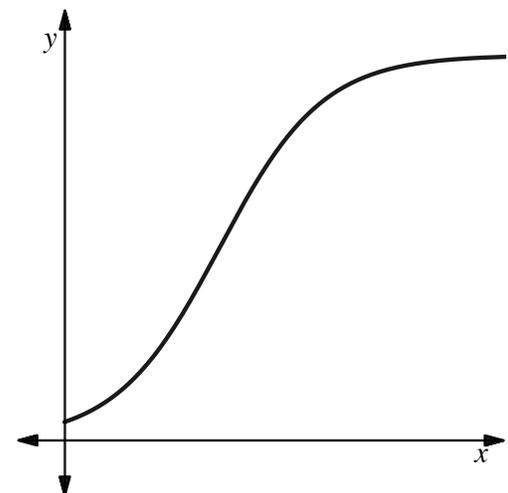
3. After doing some market research, Crunchy Cookie Inc. has found that their profit on cookies after spending x amount on advertising can be modeled by $P(x) = 5000 + 1000x - 5x^2$. Both x and $P(x)$ are measured in thousands of dollars.

- What is the most profit that Crunchy Cookie Inc. can make?
- How much would they have to spend on advertising to achieve this result?
- Is there ever a time when Crunchy Cookie Inc. will make no profit? Explain why or why not.

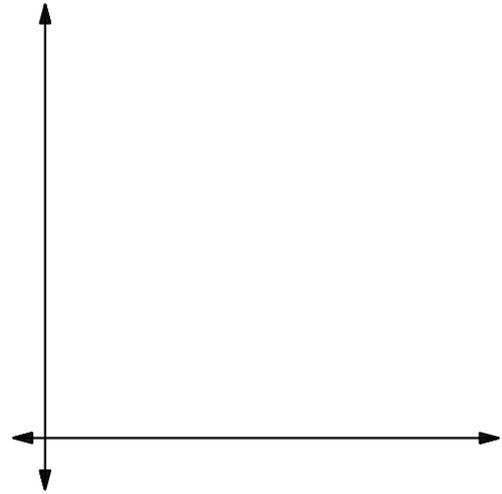


4. The graph of the function $y = f(x)$ models the relationship between two variables x and y .

- Describe what is happening to the values of y as x increases. Be as precise as possible.
- What context could the independent and dependent variables of this graph depict? Explain your choice.



5. The price of a carton of eggs stayed roughly around **\$1.80** between **2009** and **2014** . In the year **2015** , the price of eggs increased, reaching a peak of **\$2.90** , then decreased again. Since **2016** , the price of eggs has been increasing, gradually at first and then more rapidly, reaching a maximum price of **\$4.82** in January of **2023** . Sketch a possible graph of the function giving the price of a carton of eggs with respect to the year. Label and scale both axes appropriately.



6. The rate at which people enter an art museum, in people per hour, is modeled by a function r . The graph of $y = r(t)$ is shown below, where t is measured in hours after the museum opens.

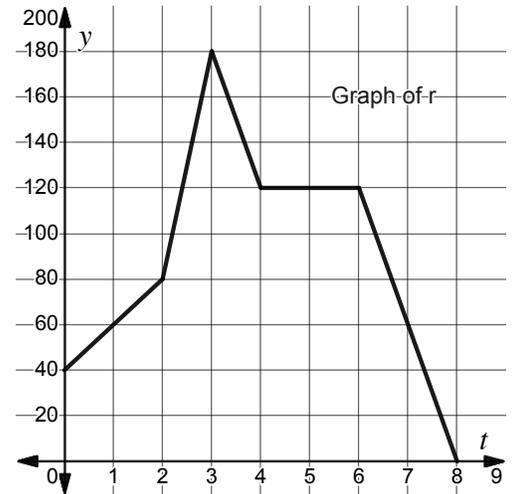
a. Identify the interval(s) on which r is increasing. What does this mean in the context of this problem?

b. Identify the interval(s) on which r is constant. What does this mean in the context of this problem?

c. Identify the maximum value of r and interpret its meaning in the context of this problem.

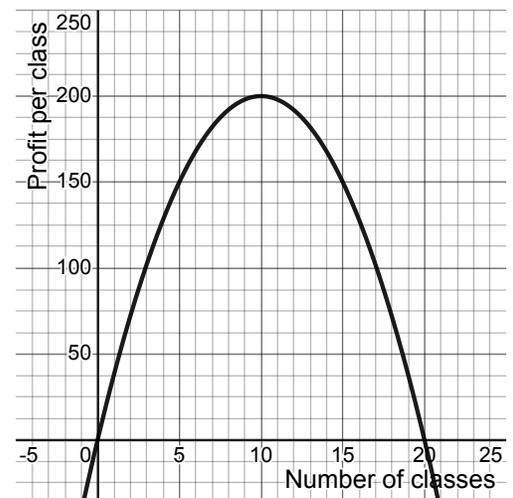
d. When is $r(t) = 0$? What does this mean in the context of this problem?

e. Holly says that the number of people in the museum is decreasing between $t = 6$ and $t = 8$. Is this an accurate statement? Why or why not?



7. Jackhammer Fit is a gym that offers various exercise classes throughout the week. The owner's goal is to maximize profit. If they don't offer enough classes, the profit will be low. However, if they offer too many classes, the members will be spread too thin and the expenses (ex: instructor, utilities) will outweigh the profit from the members. The profit per class in dollars, $P(x)$, is modeled by the function $P(x) = 40x - 2x^2$, where x represents the number of classes offered per week.

- What is the maximum profit per class that Jackhammer Fit can make?
- How many classes per week would they need to offer to achieve this result?
- How much would the TOTAL weekly profit increase by if the gym goes from having 10 classes per week to 15 classes per week? Does it make sense to go from 10 to 15 classes per week even though the profit per class decreases?

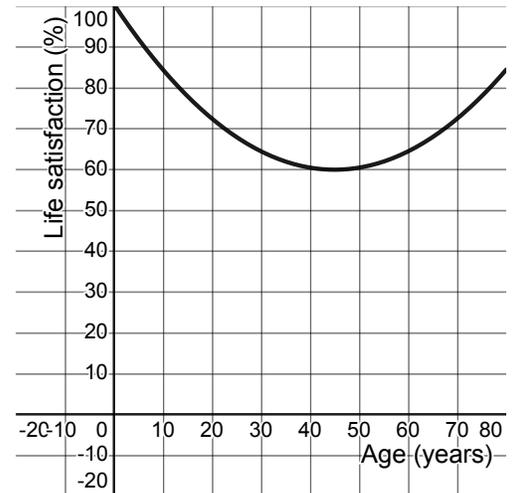


8. Studies show that life satisfaction tends to be very high among children but decreases as age increases until a certain point where life satisfaction begins to increase again. Life satisfaction $S(a)$ is modeled by the function $S(a) = 0.02(x - 45)^2 + 60$, where a represents a person's age, from 0 to 80 years, and $S(a)$ represents their life satisfaction rating, as a percent.

a. Approximately at what age is life satisfaction at a minimum?

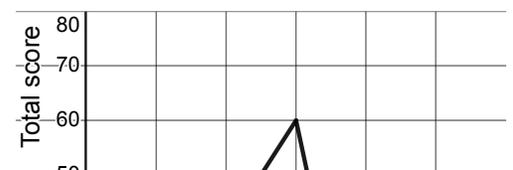
b. At what age is life satisfaction at an absolute maximum?

c. Approximately what is the average rate of change of life satisfaction for individuals between age 50 and 70?

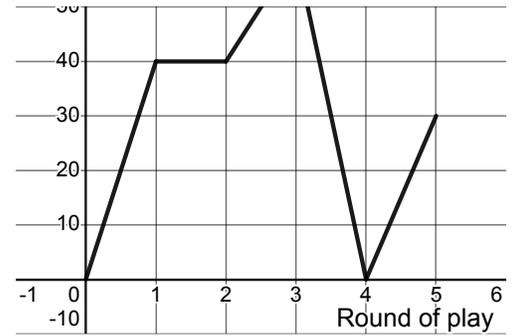


9. In the game, Pass the Pigs, players roll two pigs (instead of dice). Depending on how the pigs land, various numbers of points can be earned. A player can continue to roll until they are satisfied with their score for that round, but if both pigs land on their right side, then the player loses all the points accumulated in that round. If one pig ever lands on top of the other pig, this undignified position causes the player to lose ALL points from all previous rounds. The first player to earn 100 points wins. The total score for a player, in points, is modeled by the function s . The graph $y = s(r)$ is shown, where r is measured in rounds of play for the game.

a. Identify the interval(s) on which $s(r)$ is increasing. Over which of these intervals did the player earn the most points?



b. Identify the interval(s) on which $s(r)$ is constant. What does this mean in the context of this problem?



c. Identify the maximum of $s(r)$ and interpret its meaning in the context of this problem.

d. $s(r)$ decreased during Round 4. What happened during this round?

e. When Katie reviews the graph, she explains that player ended the game with a total of 30 points. Is this an accurate statement? Why or why not?

10. Let $S(t)$ model the number of subscribers, in thousands, to a certain podcast over time in months, t . The graph of S is shown.

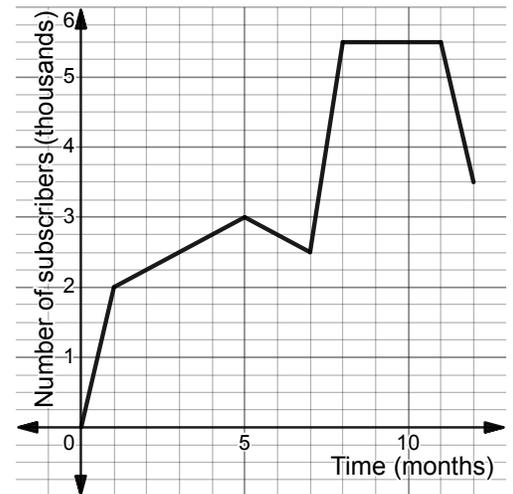
a. What time period had the greatest increase in the number of subscribers? How do you know?

b. Find $S(5)$ and interpret your answer in the context of this problem.

c. Are there any time periods when there was no change in the number of subscribers? If so, when?

d. At what time(s) were there 2,500 subscribers?

e. Did the podcast ever lose subscribers? If so, when?



11. We're Cheesy pizza shop charges \$0.05 per square inch for their choose-your-own-size cheese pizza. Therefore, the cost of a cheese pizza is $C(r) = 0.05\pi r^2$, where r is the radius of the pizza.
- Find $C(10)$ and interpret this value in the context of the problem.
 - The largest pizza the pizza oven can hold costs \$50.89. What is the radius, r , of the maximum choose-your-own-size cheese pizza?
 - Is the cost of pizza increasing at an increasing rate or a decreasing rate? Explain.
12. A business owner determines that their profit is a function of the number of units they produce, but due to supply and demand their profit doesn't continue to increase indefinitely as they produce more units. The equation $P(x) = -4x^2 + 2000x$ gives the expected profit earned, in dollars, when making x units.
- Find $P(100)$ and interpret this value in the context of the problem.
 - Explain why producing 270 units is not optimal.
 - What is the maximum expected profit?