1.1 A Preview of Calculus (1920508)

Current Score: 0/52

Question	1	2	3	4	5	6	7	8	9	10	**Total**
Points	0/2	0/6	0/2	0/2	0/4	0/6	0/6	0/18	0/3	0/3	**0/52**

1. 0/2 points LarCalc9 1.1.001.MI. [1385893]

Consider the following problem.

Find the distance traveled in 20 seconds by an object traveling at a constant velocity of 26 feet per second.

Decide whether the problem can be solved using precalculus, or whether calculus is required.

- The problem can be solved using precalculus.
- The problem requires calculus to be solved.

If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

______ ft

Solution or Explanation

Precalculus: (26 ft/sec)(20 sec) = 520 ft

2. 0/6 points LarCalc9 1.1.001.MI.SA. [1419850]

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Tutorial Exercise

Consider the following problem.

Find the distance traveled in 27 seconds by an object traveling at a constant velocity of 25 feet per second.

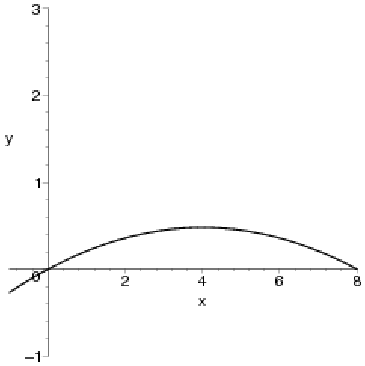
Decide whether the problem can be solved using precalculus, or whether calculus is required.

If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

3. 0/2 points LarCalc9 1.1.003. [1086229]

Consider the following problem.

A bicyclist is riding on a path modeled by the function $f(x) = 0.03(8x - x^2)$, where x and $f(x)$ are measured in miles. Find the rate of change of elevation when $x = 1$. (Round your answer to two decimal places.)



Decide whether the problem can be solved using precalculus, or whether calculus is required.

- The problem can be solved using precalculus.
- The problem requires calculus to be solved.

If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

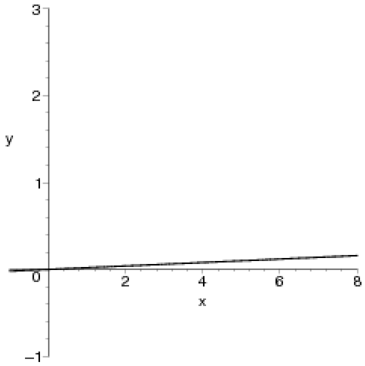
Solution or Explanation

Calculus required: Slope of the tangent line at $x = 1$ is the rate of change, and equals about 9/50.

4. 0/2 points larcalc9 1.1.004.nva [1083777]

Consider the following problem.

A bicyclist is riding on a path modeled by the function $f(x) = 0.02x$, where x and $f(x)$ are measured in miles. Find the rate of change of elevation when $x = 2$.



Decide whether the problem can be solved using precalculus, or whether calculus is required.

- The problem can be solved using precalculus.
- The problem requires calculus to be solved.

If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

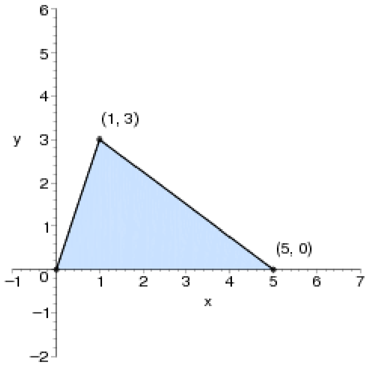
Solution or Explanation

Precalculus: rate of change = slope = 1/50

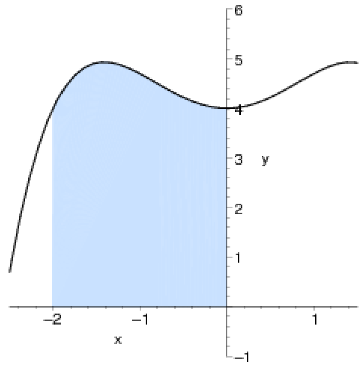
5. 0/4 points LarCalc9 1.1.005.SBS. [1255861]

Find the area of the shaded region.

(a)



(b)



Decide whether the problem can be solved using precalculus, or whether calculus is required. If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

STEP 1: Consider the figure in part (a). Since this region is simply a triangle, you may use precalculus methods to solve this part of the problem. First determine the height of the triangle and the length of the triangle's base.

height [ ] units

base [ ] units

STEP 2: Compute the area of the triangle by employing a formula from precalculus, thus finding the area of the shaded region in part (a).

[ ] square units

STEP 3: Consider the figure in part (b). Since this region is defined by a complicated curve, the problem seems to require calculus. Find an approximation of the shaded region by using a graphical approach. (*Hint:* Treat the shaded region as approximately equivalent to a triangle on top of a rectangle and sum the areas of these objects.)

[ ] square units

Solution or Explanation

(a) Precalculus: Area $= \frac{1}{2}bh = \frac{1}{2}(5)(3) = \frac{15}{2}$ sq. units

(b) Calculus required: Area $= bh$

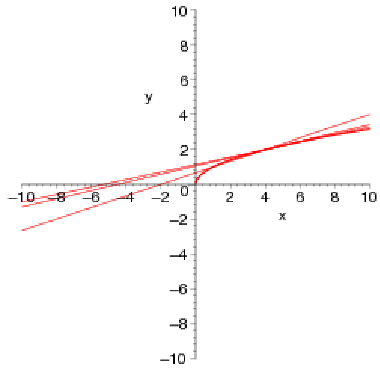
$\approx 2(4.5)$

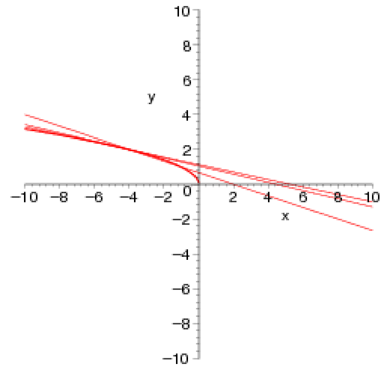
$= 9$ sq. units

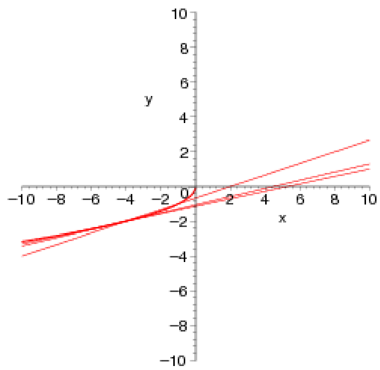
6. 0/6 points LarCalc9 1.1.006. [1083785]

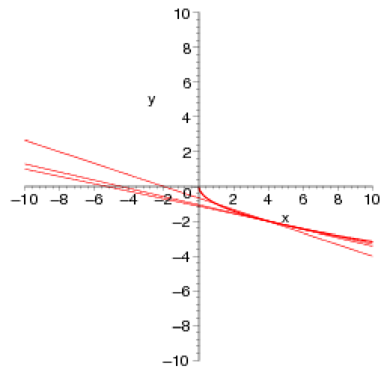
Consider the function $f(x) = \sqrt{x}$ and the point $P(4,2)$ on the graph f.

(a) Graph f and the secant lines passing through the point $P(4, 2)$ and $Q(x, f(x))$ for x-values of 1, 5, and 7.









(b) Find the slope of each secant line. (Round your answers to three decimal places.)

[ ] (line passing through $Q(1, f(x))$)

[ ] (line passing through $Q(5, f(x))$)

[ ] (line passing through $Q(7, f(x))$)

(c) Use the results of part (b) to estimate the slope of the tangent line to the graph of f at $P(4,2)$.

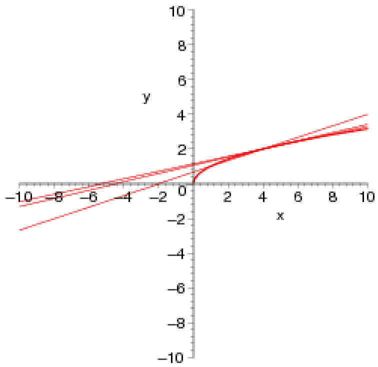
[ ]

Describe how to improve your approximation of the slope.

- Define the secant lines with points closer to P.
- Choose secant lines that are nearly vertical.
- Choose secant lines that are nearly horizontal.
- Define the secant lines with points farther away from P.

Solution or Explanation

$f(x) = \sqrt{x}$

(a) 

(b) slope $= m = \dfrac{\sqrt{x} - 2}{x - 4}$

$$= \frac{\sqrt{x} - 2}{(\sqrt{x} + 2)(\sqrt{x} - 2)}$$

$$= \frac{1}{\sqrt{x} + 2},\ x \neq 4$$

$x = 1$: $m = \dfrac{1}{\sqrt{1} + 2} \approx 0.333$

$x = 5$: $m = \dfrac{1}{\sqrt{5} + 2} \approx 0.236$

$x = 7$: $m = \dfrac{1}{\sqrt{7} + 2} \approx 0.215$

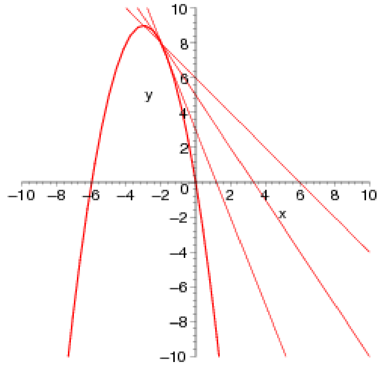
(c) At $P(4, 2)$ the slope is $\dfrac{1}{\sqrt{4} + 2} = \dfrac{1}{4} = 0.25$.

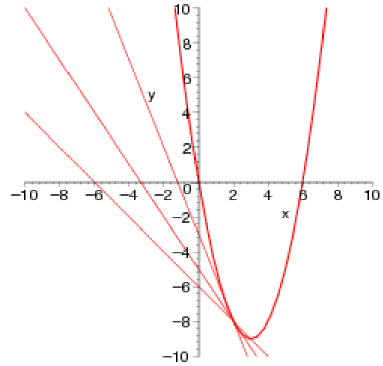
You can improve your approximation of the slope at $x = 4$ by considering x-values very close to 4.

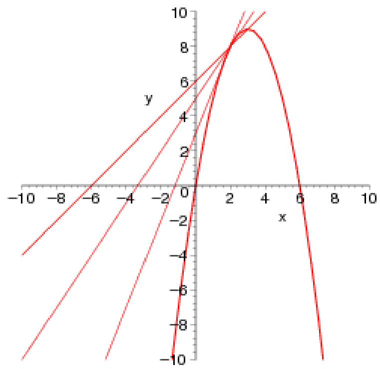
7. 0/6 points LarCalc9 1.1.007.MI. [1341671]

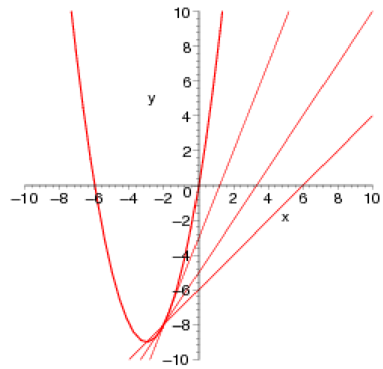
Consider the function $f(x) = -6x + x^2$ and the point $P(2, -8)$ on the graph of f.

(a) Graph f and the secant lines passing through $P(2, -8)$ and $Q(x, f(x))$ for x-values of 3, 2.5, 1.5.









(b) Find the slope of each secant line.

[ ] (line passing through $Q(3, f(x))$)

[ ] (line passing through $Q(2.5, f(x))$)

[ ] (line passing through $Q(1.5, f(x))$)

(c) Use the results of part (b) to estimate the slope of the tangent line to the graph of f at $P(2, -8)$.

[ ]

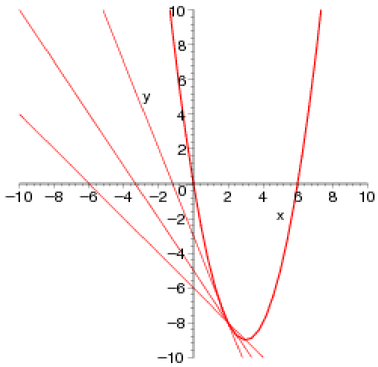
Describe how to improve your approximation of the slope.

- Define the secant lines with points closer to P.
- Choose secant lines that are nearly horizontal.
- Choose secant lines that are nearly vertical.
- Define the secant lines with points farther away from P.

Solution or Explanation

$f(x) = -6x + x^2$

(a)



(b) slope $= m = \dfrac{-6x + x^2 + 8}{x - 2} = \dfrac{(x - 2)(x - 4)}{x - 2}$

$= (x - 4),\ x \neq 2$

For $x = 3$, $m = \dfrac{-9. + 8}{3 - 2} = -1$

For $x = 2.5$, $m = \dfrac{-8.75 + 8}{2.5 - 2} = -1.5$

For $x = 1.5$, $m = \dfrac{-6.75 + 8}{1.5 - 2} = -2.5$

(c) At $P(2, -8)$, the slope is -2. You can improve your approximation by considering values of x close to 2.

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8. 0/18 points LarCalc9 1.1.007.MI.SA. [1419772]

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Consider the function $f(x) = 4x - x^2$ and the point $P(2, 4)$ on the graph of f.

Part (a)

Graph f and the secant lines passing through $P(2, 4)$ and $Q(x, f(x))$ for x-values of 3, 2.5, 1.5.

Part (b)

Find the slope of each secant line.

Part (c)

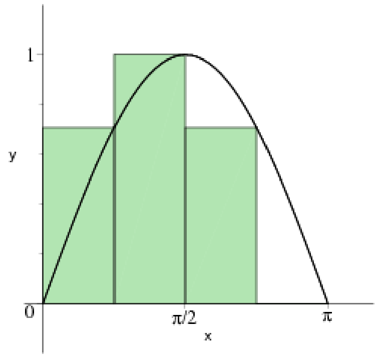
Use the results of part (b) to estimate the slope of the tangent line to the graph of f at $P(2, 4)$.

Describe how to improve your approximation of the slope.

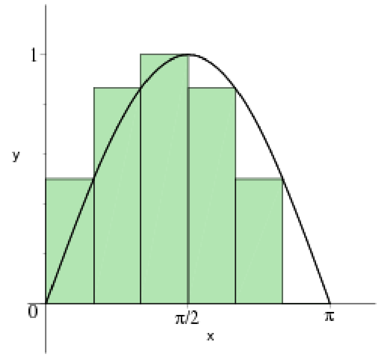
9. 0/3 points LarCalc9 1.1.008. [1090329]

Consider the figures below.

(1)



(2)



(a) Use the rectangles in each graph to approximate the area of the region bounded by $y = \sin(x)$, $y = 0$, $x = 0$, and $x = \pi$. (Round your answer to three decimal places.)

[ ] figure (1)
[ ] figure (2)

(b) Describe how you could continue this process to obtain a more accurate approximation of the area.

- Continually increase the height of all rectangles.
- Continually increase the number of rectangles.
- Continually decrease the number of rectangles.
- Continually decrease the height of all rectangles.

Solution or Explanation

(a) For the figure on the left, each rectangle has width $\frac{\pi}{4}$.

$$\text{Area} \approx \frac{\pi}{4}\left[\sin\left(\frac{\pi}{4}\right) + \sin\left(\frac{\pi}{2}\right) + \sin\left(\frac{3\pi}{4}\right) + \sin(\pi)\right]$$
$$= \frac{\pi}{4}\left[\frac{\sqrt{2}}{2} + 1 + \frac{\sqrt{2}}{2}\right]$$
$$= \frac{\sqrt{2} + 1}{4}\pi \approx 1.896$$

For the figure on the right, each rectangle has width $\frac{\pi}{6}$.

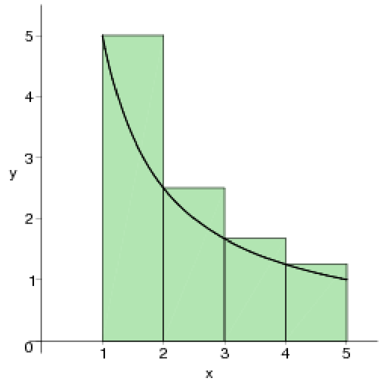
$$\text{Area} \approx \frac{\pi}{6}\left[\sin\left(\frac{\pi}{6}\right) + \sin\left(\frac{\pi}{3}\right) + \sin\left(\frac{\pi}{2}\right) + \sin\left(\frac{2\pi}{3}\right) + \sin\left(\frac{5\pi}{6}\right) + \sin(\pi)\right]$$
$$= \frac{\pi}{6}\left[\frac{1}{2} + \frac{\sqrt{3}}{2} + 1 + \frac{\sqrt{3}}{2} + \frac{1}{2}\right]$$
$$= \frac{\sqrt{3} + 2}{6}\pi \approx 1.954$$

(b) You could obtain a more accurate approximation by using more rectangles. You will learn later that the exact area is 2.

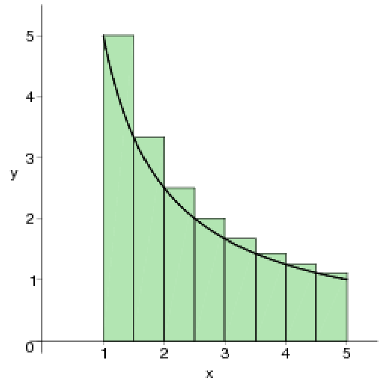
10. 0/3 points LarCalc9 1.1.009. [1343958]

Consider the figures below.

(1)



(2)



(a) Use the rectangles in each graph to approximate the area of the region bounded by $y = 5/x$, $y = 0$, $x = 1$, and $x = 5$. (Round your answers to three decimal places.)

[ ] figure (1)
[ ] figure (2)

(b) Describe how you could continue this process to obtain a more accurate approximation of the area.

- Continually decrease the number of rectangles.
- Continually decrease the height of all rectangles.
- Continually increase the height of all rectangles.
- Continually increase the number of rectangles.

Solution or Explanation

(a) Area $\approx 5 + \frac{5}{2} + \frac{5}{3} + \frac{5}{4} \approx 10.417$

Area $\approx \frac{1}{2}\left(5 + \frac{5}{1.5} + \frac{5}{2} + \frac{5}{2.5} + \frac{5}{3} + \frac{5}{3.5} + \frac{5}{4} + \frac{5}{4.5}\right) \approx 9.145$

(b) You could improve the approximation by using more rectangles.

Assignment Details