**1.** **(1 point)** local/Cooper07/Cooper_7_13_32.pgml
**Cooper** Section 7.13 #32

Solve $a \times b^t = c \times d^t$ for $t$.

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**2.** **(1 point)** local/Cooper08/Cooper_8_2_8.pgml
**Cooper** Section 8.2 #8

The population (in millions) of a certain country $t$ years after 2000 is given by the function $p(t)$. There were 480 million in 2000. If $p'(t) = 5$ throughout the time span 2000 to 2010, what was the population of the country in 2007?

**Hint**: What is the practical signifigance of $p'(t) = 5$?

The population in 2007 was ___ million people

Online Math Lab resources for this problem:
- **Rate of Change**
- **Word Problems**

**3.** **(1 point)** local/Cooper08/Cooper_8_2_9.pgml
**Cooper** Section 8.2 #9

After $t$ years I have $f(t)$ thousand dollars in the bank.

a. What are the units of $f'(t)$?
- A. Dollars
- B. Thousands of dollars per year.
- C. Years
- D. Years per thousand dollars
- E. Dollars per year
- F. Thousands of dollars

b. What is the practical meaning of $f'(7) = 0.3$?
- A. My account is increasing at a rate of 300 dollars per year at the start of year 7.
- B. My account will increase by 300 dollars during the 7th year.
- C. My account is increasing at a rate of 7000 dollars a year in April of the first year.
- D. My account is increasing at a rate of 30 cents per year at the start of year 7.

Online Math Lab resources for this problem:
- **Rate of Change**
- **Word Problems**

**4.** **(2 points)** local/Cooper08/Cooper_8_3_2.pgml
**Cooper** Section 8.3 #2

The volume (in $m^3$) of water in my (large) bathtub when I pull out the plug is given by $f(t) = 4 - t^2$ (where $t$ is in minutes). This formula is only valid for the two minutes it takes my bath to drain.

a. Find the average rate the water leaves my tub between $t = 1$ and $t = 2$.

Average rate = _____ $m^3/s$

b. Find the average rate the water leaves my tub between $t = 1$ and $t = 1.1$.

Average rate = _____ $m^3/s$

c. What would you guess is the exact rate water leaves my tub at $t = 1$?

Average rate = _____ $m^3/s$

d. In this bit $h$ is a very small number. Find the average rate the water leaves my tub between $t = 1$ and $t = 1+h$. (Simplify this as much as possible!)

Average rate = _____ $m^3/s$

e. What do you get if you put in $h = 0$ in the answer to part (d)?

Answer: _____ $m^3/s$

Online Math Lab resources for this problem:
- **Rate of Change**
- **Word Problems**

**5.** **(1 point)** local/Cooper08/Cooper_8_4_3.pgml
**Cooper** Section 8.4 #3

An ice cube is melting. The mass of the ice cube after $t$ minutes is $m(t)$ grams. You are told that the rate of change of $m(t)$ is $-2$ grams/min.

a. How much mass does the ice cube lose in 5 minutes?

_____ grams

b. If the ice cube starts out with a mass of 90 grams, how long until it has all melted?

_____ minutes

Online Math Lab resources for this problem:
- **Rate of Change**
- **Word Problems**

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**6.** **(1 point)** `local/Cooper08/Cooper_8_4_4.pgml`
**Cooper** Section 8.4 #4

Acceleration is the rate of change of velocity. The velocity (positive means down) of a pumpkin thrown off the top of Cheadle hall $t$ seconds after launch is $32t$ ft/sec (until it hits the ground).

a. What is the average rate of change of velocity between $t = 1$ and $t = 2$?

_____ feet per second per second

b. What is the average rate of change of velocity between $t = 1$ and $t = 1.1$?

_____ feet per second per second

c. If the pumpkin lands after 3 seconds, what is the speed of the pumpkin when it hits?

_____ feet per second

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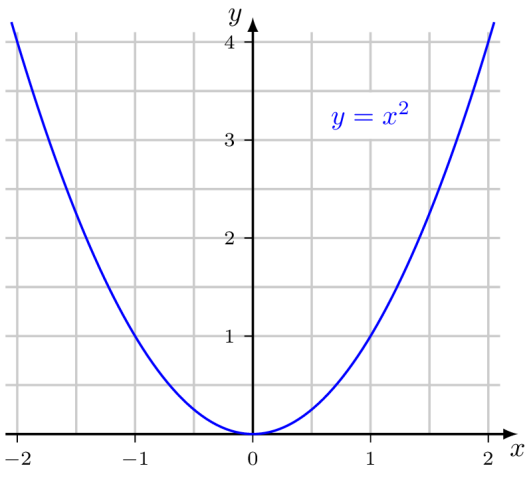
**7.** **(1 point)** `local/Cooper08/Cooper_8_4_6.pgml`
**Cooper** Section 8.4 #6

Use the graph of $y = x^2$ below to calculate the following.




a. What is the slope of the tangent line to the graph at $x = 1.5$?

slope = _____

b. What is the slope of the tangent line to the graph at $x = -1$?

slope = _____

c. What is the slope of the secant line that goes through the points with $x$-coordinates $x = 0.5$ and $x = 1$?

slope = _____

Online Math Lab resources for this problem:
- **Rate of Change**
- **Word Problems**

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**8.** **(1 point)** `local/Cooper08/Cooper_8_5_1.pgml`
**Cooper** Section 8.5 #1

Let $A(r)$ be the area in square meters enclosed by a circle of radius $r$ meters.

a. What are the units of $A'(r)$?

- A. meters
- B. meters per minute
- C. cubic meters
- D. square meters

b. What is the meaning of the statement that $A'(3) = 6\pi$?

- A. When the radius is 3 meters, the area is increasing at a rate of $6\pi$ square meters per meter of radius.
- B. The area increases by $6\pi$ square meters whenever the radius is increased by one meter.
- C. The area increases by $6\pi$ square meters whenever the radius is increased by three meters.
- D. When the radius is $6\pi$ meters, the area is increasing at a rate of 3 square meters per meter of radius.
- E. When the radius is 3 meters, the area is increasing at a rate of $6\pi$ square meters per three meters of radius.
- F. The area increases by 3 square meters whenever the radius is increased by [6‘π meters.
- G. The area increases by 3 square meters whenever the radius is increased by one meter.

Online Math Lab resources for this problem:
- **Rate of Change**
- **Word Problems**

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**9.** **(2 points)** `local/Cooper08/Cooper_8_5_2.pgml`
**Cooper** Section 8.5 #2

The height of an airplane above the ground when it has flown $x$ miles is $h(x)$ feet.

a. What are the units of $h'(x)$?
- A. unitless
- B. foot-miles
- C. miles per foot
- D. feet per mile
- E. feet per hour

b. What is the meaning of the statement that $h'(10) = 500$?
- A. When the plane has flown 10 miles it is rising at a rate of 500 feet per 10 miles of flight.
- B. The plane rises 500 feet for every mile it flies.
- C. After 11 miles the plane is 500 feet higher than it was after 10 miles.
- D. The plane rises 10 feet for every 500 miles it flies.
- E. The plane rises 10 feet for every mile it flies.
- F. When the plane has flown 10 miles it is rising at a rate of 500 feet per mile of flight.
- G. The plane rises 500 feet for every 10 miles it flies.

c. During which part of the flight would you expect $h'(x)$ to be negative?
- A. cruising
- B. ascent
- C. acceleration
- D. descent
- E. deceleration

d. What would it mean if $h'(x)$ were negative?
- A. The plane is gaining speed.
- B. The plane is losing speed.
- C. The plane is taking off.
- D. The plane is getting colder.
- E. The plane is losing altitude.
- F. The plane is gaining altitude.

Online Math Lab resources for this problem:
- **Rate of Change**
- **Word Problems**

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**10.** **(1 point)** `local/Cooper08/Cooper_8_5_3.pgml`
**Cooper** Section 8.5 #3

The volume of water in a reservoir depends on the height of the water measured on a marker on a dam. If the volume is $V(x)$ gallons when the height is $x$ meters:

a. What are the units of $V'(x)$?
- A. gallons per minute
- B. meters per gallon
- C. gallons per meter
- D. gallon-meters

b. What is the meaning of $V'(30) = 5 \cdot 10^7$?
- A. When the height is $5 \cdot 10^7$ meters, the volume is increasing at a rate of 30 gallons per meter of height.
- B. The volume increases by 30 gallons whenever the height is increased by one meter.
- C. When the height is 30 meters, the volume is increasing at a rate of $5 \cdot 10^7$ gallons per meter of height.
- D. The volume increases by 30 gallons whenever the height is increased by $5 \cdot 10^7$ meters.
- E. The volume increases by $5 \cdot 10^7$ gallons whenever the height is increased by 30 meters.
- F. When the height is 30 meters, the volume is increasing at a rate of $5 \cdot 10^7$ gallons per 30 meters of height.
- G. The volume increases by $5 \cdot 10^7$ gallons whenever the height is increased by one meter.

Online Math Lab resources for this problem:
- **Rate of Change**
- **Word Problems**