Math 1001 Practice Test 1   Fall 2018

1.

Consider a population that grows according to the recursive rule $P_n = P_{n-1} + 105$, with initial population $P_0 = 40$.

Then:

$P_1 =$

$P_2 =$

Find an explicit formula for the population. Your formula should involve n (use lowercase n)

$P_n =$ Preview

Use your explicit formula to find P_{100}

$P_{100} =$

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Show Answer 145

Show Answer 250

Show Answer $40 + n \cdot 105$

Show Answer 10540

2.

A population of beetles are growing according to a linear growth model. The initial population (week 0) is $P_0 = 6$, and the population after 8 weeks is $P_8 = 54$.

Find an explicit formula for the beetle population after n weeks.

$P_n =$ [ ] Preview

After how many weeks will the beetle population reach 144?

[ ] Preview weeks

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Show Answer $6 + n \cdot 6$

Show Answer 23

3.

A city currently has 124 streetlights. As part of a urban renewal program, the city council has decided to install 2 additional streetlights at the end of each week for the next 52 weeks.

How many streetlights will the city have at the end of 45 weeks?

[ ] streetlights

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Show Answer 214

4.

The table below shows values for the linear function f(x). Fill in the missing value on the table.

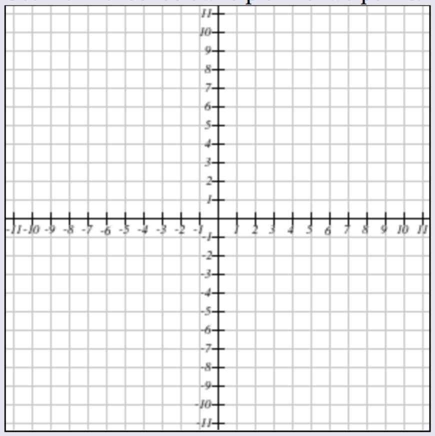
x	3	7	11	15
f(x)	-17	-33	-49	

Show Answer -65

5.

Find the equation for the **linear function** that passes through the points $(-5, 7)$ and $(5, 3)$. Answers must use whole numbers and/or fractions, not decimals.

a. Use the line tool below to plot the two points.



Clear All Draw:

b. State the slope between the points as a reduced fraction. Preview

c. State the y-intercept of the linear **function**.

d. State the linear function. Preview

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Show Answer

Show Answer $-\frac{2}{5}$

Show Answer $(0, 5)$

Show Answer $f(x) = -\frac{2}{5}x + 5$

6.

In 1992, the moose population in a park was measured to be 2000. By 1999, the population was measured again to be 5000. If the population continues to change linearly:

Find a formula for the moose population, P, in terms of t, the years since 1990.

$P =$ [ ] Preview

What does your model predict the moose population to be in 2006?

[ ] Preview

Show Answer $428.57142857143 \cdot t + 1142.8571428571$

Show Answer 8000

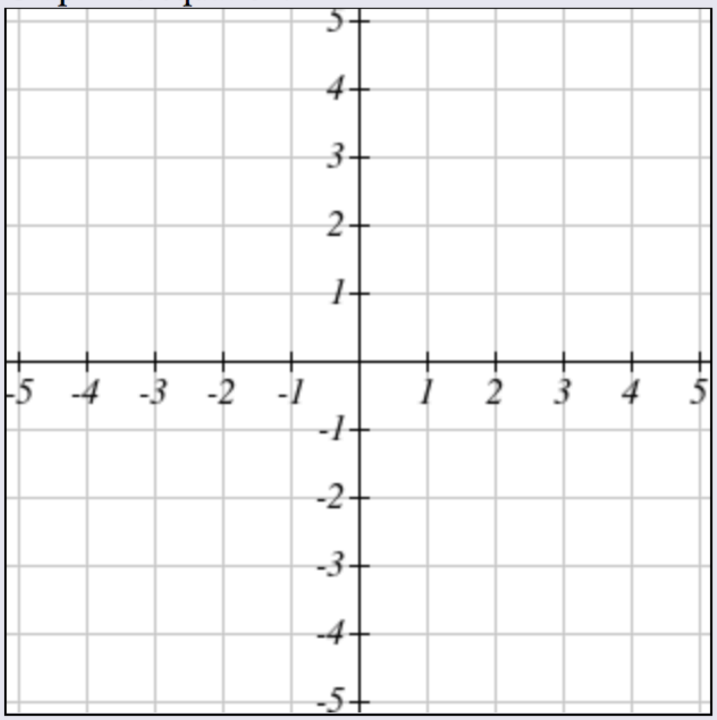
7.

Find the slope and y-intercept to graph the equation $f(x) = 3x - 2$.

Slope:

y-intercept:

Graph the equation.



Clear All Draw: 

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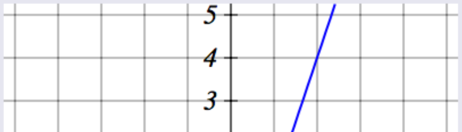
Show Answer 3

Show Answer -2



8. At \$300 per person, an airline anticipates selling 200 tickets for a particular flight. At \$450 per person, the airline anticipates selling 150 tickets for the same flight.

Assume a linear relation between the cost per ticket C and the number of tickets, x sold. Which of the following equations can be used to model the given information?

- ○ $C = -4x+900$
- ○ $C = -4\,x+905$
- ○ $C = -3x+900$
- ○ $C = -3x+905$

Get help: Video

Show Answer $C = -3x+900$

9. The cost $C(x)$, where x is the number of miles driven, of renting a car for a day is \$23 plus \$0.65 per mile.

What is the slope of the linear function and its units? ______ Select an answer - select the correct units

What is the y-intercept and its units? ______ Select an answer - select the correct units

What is the linear function, $C(x)$? ______ Preview

Show Answer 0.65

Show Answer dollars per mile

Show Answer 23

Show Answer dollars

Show Answer $C(x) = 23 + 0.65x$

10.

Carl has already stuffed 17 envelopes, and will continue to stuff 7 envelopes per minute. Find a linear function E that represents the total number of envelopes Carl will have stuffed in t minutes, assuming he doesn't take any breaks.

$E(t) =$ [ ] Preview

Show Answer $7 \cdot t + 17$

11.

Find all zeros of the function: $m(x) = x^2 - 8x + 15$.

The zeros are $x =$ [ ]

Show Answer 5,3

12.

The demand equation for a certain product is given by $p = 130 - 0.055x$, where p is the unit price (in dollars) of the product and x is the number of units produced. The total revenue obtained by producing and selling x units is given by $R = xp$.

Determine prices p that would yield a revenue of 7880 dollars.

Lowest such price = [ ] Preview dollars

Highest such price = [ ] Preview dollars

Get help: Video

Show Answer Process:

Setup revenue equation:

$x(130 - 0.055x) = 7880$

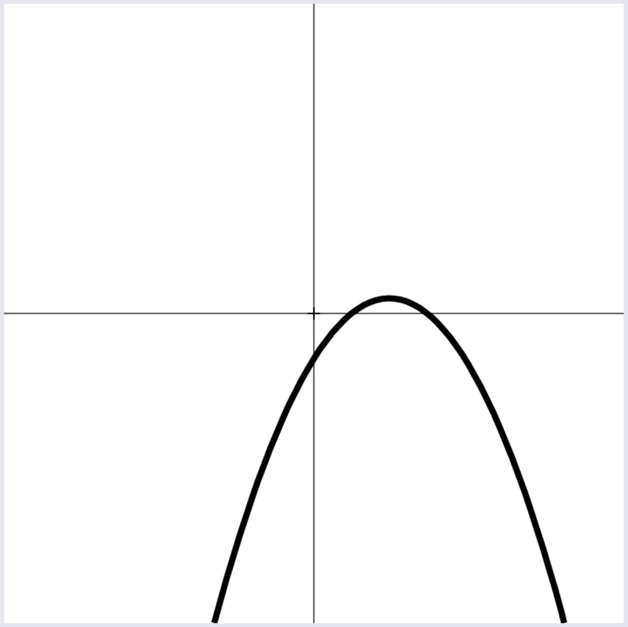
Use quadratic equation to solve for x

Plug those x values into the price equation $p = 130 - 0.055x$ to solve for p

p = 3.4240306613042 or 126.5759693387

13.

Use the graph of the function $f(x) = ax^2 + bx + c$ given below, what can you say about the value of a and the discriminant of the equation $ax^2 + bx + c = 0$?



The value of a...

- is less than 0
- is greater than 0
- is equal to 0

The value of the discriminant...

- is less than 0
- is equal to 0
- is greater than 0

Show Answer is less than 0

Show Answer is greater than 0

14.

Determine the vertex of the quadratic function $y = x^2 - 10x + 21$:

- (5,42)
- (5,-4)
- (10,-4)
- (10,21)
- (5,21)

Show Answer (5,-4)

15.

An object is thrown upward at a speed of 64 feet per second by a machine from a height of 16 feet off the ground. The height h of the object after t seconds can be found using the equation $h = -16t^2 + 64t + 16$

When will the height be 71 feet?

[ ] Select an answer

When will the object reach the ground?

[ ] Select an answer

Get help: Video

Show Answer 1.25, 2.75

Show Answer seconds

Show Answer 4.24

Show Answer seconds

16.

The engine in a car has a power curve approximated by

$$y = -\frac{x^2}{10000} + \frac{27x}{31} - 22$$

where x is the RPM and y is the horsepower generated.

At what RPM is the engine putting out maximum horsepower?. Round your answer to three decimal places.

[ ] RPM

What is the maximum horsepower? Round your answer to three decimal places.

[ ]

Show Answer 4354.839

Show Answer 1874.462

17.

A population grows according to an exponential growth model. The initial population is $P_0 = 6$, and the growth rate is $r = 0.25$.

Then:

$P_1 =$

$P_2 =$

Find an explicit formula for P_n. Your formula should involve n.

$P_n =$ Preview

Use your formula to find P_{11}

$P_{11} =$

Give all answers accurate to at least one decimal place

Get help: Video

Show Answer 7.5

Show Answer 9.375

Show Answer $6 \cdot (1 + 0.25)^n$

Show Answer 69.849193096161

18.

The crime rate of a certain city is increasing by exactly 2 % each year. If there were 550 crimes in the year 1990 and the crime rate remains constant each year, determine the approximate number of crimes in the year 2021.

Round to the nearest whole number.

Preview

Show Answer 1016

19. A vehicle purchased for $27500 depreciates at a constant rate of 6 % . Determine the approximate value of the vehicle 12 years after purchase.

Round to the nearest whole number.

Preview

Show Answer 13088

20.

Car Value

The function $V(t) = 17200(0.94)^t$ represents the value (in dollars) of a car t years after its purchase. Use this function to complete the statements below.

The value of this car is [Select an answer] at a rate of [ ] [Select an answer]

The purchase price of the car was [ ] [Select an answer] .

Get help: Video

Show Answer decreasing

Show Answer 6

Show Answer percent per year

Show Answer 17200

Show Answer dollars

Linear Growth

If a quantity starts at size P_0 and grows by d every time period, then the quantity after n time periods can be determined using either of these relations:

Recursive form:

$P_n = P_{n-1} + d$

Explicit form:

$P_n = P_0 + d\,n$

In this equation, d represents the **common difference** – the amount that the population changes each time n increases by 1

Exponential Growth

If a quantity starts at size P_0 and grows by $R\%$ (written as a decimal, r) every time period, then the quantity after n time periods can be determined using either of these relations:

Recursive form:

$P_n = (1+r)\,P_{n-1}$

Explicit form:

$P_n = (1+r)^n\,P_0$ or equivalently, $P_n = P_0\,(1+r)^n$

We call r the **growth rate**.

The term $(1+r)$ is called the **growth multiplier**, or common ratio.

Logistic Growth

If a population is growing in a constrained environment with carrying capacity K, and absent constraint would grow exponentially with growth rate r, then the population behavior can be described by the logistic growth model:

$$P_n = P_{n-1} + r\left(1 - \frac{P_{n-1}}{K}\right)P_{n-1}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y = mx + b$$

$$y - y_1 = m(x - x_1)$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = a(x - h)^2 + k$$

$$h = \frac{-b}{2a} \qquad k = f(h)$$

$$(x - h)^2 + (y - k)^2 = r^2$$

$$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$

$$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$

$$\log_b x = y \Leftrightarrow b^y = x$$

$$\log_b xy = \log_b x + \log_b y$$

$$\log_b \frac{x}{y} = \log_b x - \log_b y$$

$$\log_b x^r = r\log_b x$$

$$\log_b x = \frac{\log x}{\log b} \quad \text{or} \quad \log_b x = \frac{\ln x}{\ln b}$$

$$A = lw$$

$$P = 2l + 2w$$

$$V = lwh$$

$$a^2 + b^2 = c^2$$

$$d = rt$$

$$A = P\left(1 + \frac{r}{m}\right)^{tm}$$

$$I = Prt$$

$$(f \circ g)(x) = f[g(x)]$$

$$i = \sqrt{-1}$$

$$i^2 = -1$$

$$\frac{1}{a}(x) + \frac{1}{b}(x) = 1$$

$$\frac{1}{a} + \frac{1}{b} = \frac{1}{x}$$

$$A = Pe^{rt}$$

Difference Quotient=

$$\frac{f(x + h) - f(x)}{h}$$