Summer packet Pre-Calculus week4, 19/20

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Created by Edwin Victor-Louis

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**Q1:** u and v are vectors with components $i + 2j + k$ and $-j$ respectively.

If 't' is the angle between these vectors then the value of $\cos t$ is

**A** ) 0

**B** ) $-\sqrt{3}$

**C** ) $\frac{1}{2}$

**D** ) $\frac{2}{\sqrt{6}}$

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**Q2:** Find a vector orthogonal (perpendicular) to both v and w.
v = 2i - 5j + k,          w = 3i + 3j - k.

**A** ) -10i+8j-6k

**B** ) 2i+5j+21k

**C** ) -2i-5j+5k

**D** ) 22i+12j+24k

**Q3:** Estimates for the population of Las Vegas, Nevada, are shown in the table.

| Las Vegas Population over Time | |
| --- | --- |
| Year | Population (in thousands) |
| 1990 | 261 |
| 2000 | 484 |
| 2010 | 584 |

a. A linear model for the data is $f(t) = 281.5 + 16.15t$, where $f(t)$ represents the population of Las Vegas in thousands of residents $t$ years after $1990$. Use the model to predict the population of Las Vegas in $2013$. Round your answer to the nearest thousand.

b. An exponential model for the data is $g(t) = 280.4(1.04)^t$, where $g(t)$ represents the population of Las Vegas in thousands of residents $t$ years after $1990$. Use the model to predict the population of Las Vegas in $2013$. Round your answer to the nearest thousand.

c. The actual population of Las Vegas was approximately $603,000$ in $2013$. Did either model provide an accurate prediction? Explain your answer.

d. Calculate the average rate of change for each interval shown in the table. Do the values confirm or refute your answer in part (c)?

**Q4:** Robert is collecting books to donate to the library.

The number of books he collects, $n$, is defined by $n = 14d + 21$ where $d$ is the number of days he spends collecting books.

What does $14$ represent in the context of Robert's book collecting?

**A** represents the number of books per day that are collected.

**B** represents the number of books per week that are collected.

**C** represents the number of books per month that are collected.

**D** represents the number of books per year that are collected.

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**Q5:** Which of the following is the solution to the equation $12e^{2x} = 200$?

**A** $\ln \left( \frac{100}{3} \right)$

**B** $\ln \left( \frac{50}{3} \right)$

**C** $\frac{1}{2}\ln \left( \frac{50}{3} \right)$

**D** $\ln \left( \frac{25}{3} \right)$

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**Q6: Part A**

A function $g(x)$ is obtained by shifting the graph of the function $f(x) = x^2$ three units left, stretching the graph vertically by a factor of two, reflecting that result over the $x$-axis, and then translating the graph up four units. Determine the equation of the function $g(x)$.
Choose the suitable option:

**A** $2(x+3)^2 + 4$

**B** $-2(x-3)^2 + 4$

**C** $-2(x+3)^2 + 4$

**D** None of the above

## Part B
The function $g(x)$ is now transformed $2$ units up to obtain another function $h(x)$.
The equation of the function $h(x)$ is $\boxed{\phantom{xxxxxxxxxxxxxx}}$ .

**Q7:** **Part A**

For the function $f(x) = x^2 + 10$, the average rate of change of $f$ over the interval $[-3, \ -2]$ is

[                ] .

**Part B**

Over which interval does $f$ have a positive average rate of change?

**A** $[-3, \ 3]$

**B** $[-4, \ -1]$

**C** $[-1, \ 2]$

**D** $[-3, \ 1]$

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**Q8:** **Part A**

What kind of transformation converts the graph of $f(x) = 5(x-4)^2$ into the graph of $g(x) = 5(x-4)^2 + 6$?

**A** right translation

**B** left translation

**C** up translation

**D** down translation

**Part B**

Here, the function $f(x)$ is translated [                ] units.

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**Q9:** The expression $500(1.03)^t$ models the population of a city in thousands of people $t$ years since 2010. Based on this model, answer each of the following questions.

a. What was the population of the city in the year 2010?

[                ]

b. What has the annual growth rate been since 2010?

[                ] % per year

c. What is the predicted population in 2025?

[                ]

**Q10:** Line $f$ is represented by the equation $y = \frac{1}{5}x + 2$. Line $g$, which is perpendicular to line $f$, passes through the point $(15, -4)$. Find the slope, $m_2$ of line $g$ and the equation of line $g$.
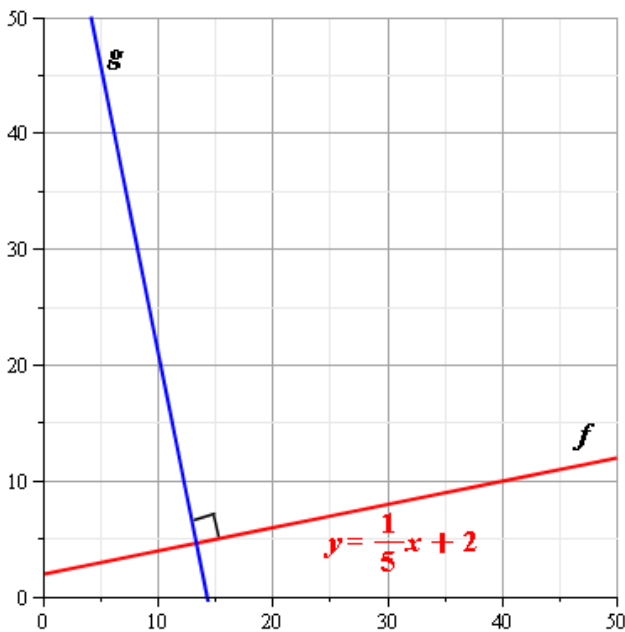
**DRAG DROP VALUES**

$-\frac{1}{5}$

$-5$

$y = -5x + 71$

$y = -\frac{1}{5}x + 71$



$m_2 = $ [ ]

Equation of line $g$:

[ ]

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**Q11:** A bank account starts with $\$3.00$. The amount in the account doubles every year.

**Part A**

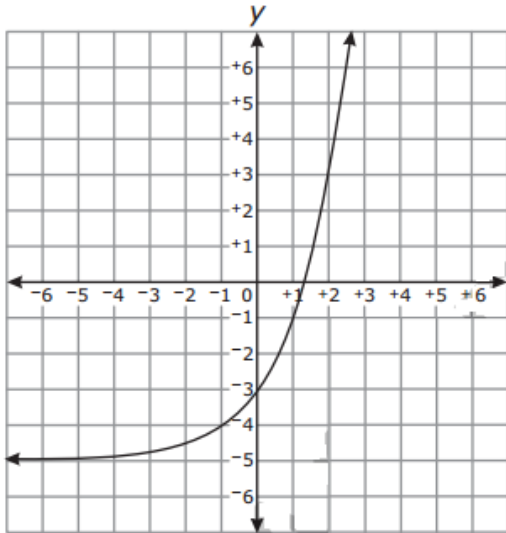Write a function to express the total amount of money, $A(t)$, in the account after $t$ years.

$A(t) = $ [ ]

**Part B**

After how many years will the account have $\$1536.00$?

[ ] years

**Q12:** The function $f(x) = 2(2)^x$ was replicated with $f(x) + k$, resulting in the function graphed below.



What is the value of $k$?

$k = $ [ ]

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**Q13:** Consider the following table of data.

| $x$ | $f(x)$ |
|-----|--------|
| 0   | 2      |
| 1   | 5      |

a. Write a formula for a linear function in the form $f(x) = ax + b$ that models the data.

$f(x) = $ [ ]

b. Write a formula for an exponential function in the form $f(x) = a(b)^x$ that models the data.

$f(x) = $ [ ]