

Formula: $A = A_0(1 + i)^n$

Part I: Multiple Choice: Shade the letter of the correct answer on the scantron form provided. (10 Marks)

1. What is the mapping rule that transforms $y = 3^x$ to $y = -2(3)^{2x-4} + 1$?

A) $(x, y) \rightarrow (\frac{1}{2}x + 4, -2y + 1)$

B) $(x, y) \rightarrow (\frac{1}{2}x + 2, -2y + 1)$

C) $(x, y) \rightarrow (\frac{1}{2}x - 4, -2y + 1)$

D) $(x, y) \rightarrow (\frac{1}{2}x - 2, -2y + 1)$

$-2(3^{2(x-2)})$
 $(x, y) \rightarrow (\frac{1}{2}x + 2, -2y + 1)$

2. Write as a single power: $\frac{(25)^{n-1}(125)^{2n+3}}{5^{n-4}}$

A) 5^{2n+6}

B) 5^{2n-2}

C) 5^{7n-3}

D) 5^{7n+11}

$\frac{5^{2n-2} 3^{6n+9}}{5^{n-4}} = \frac{5^{8n+7}}{5^{n-11}} = 5^{7n+11}$

3. A house is purchased for \$240 000 and appreciates by 4% annually. Write an exponential function that can be used to determine the value, V of the house in t years.

A) $V = 240\,000(0.4)^t$

B) $V = 240\,000(0.96)^t$

C) $V = 240\,000(1.04)^t$

D) $V = 240\,000(1.4)^t$

4. Solve for x : $\sqrt{3} = 9^{x-2}$

A) $-\frac{3}{4}$

B) $\frac{5}{4}$

C) 2

D) $\frac{9}{4}$

$3^{\frac{1}{2}} = 3^{2x-4}$
 $\frac{1}{2} = 2x - 4$
 $\frac{1}{2} + 4 = 2x$

5. What is the range of the function $y = -\frac{1}{2}(4)^{x+3} - 5$?

A) $\{y | y < -5\}$

B) $\{y | y < 5\}$

C) $\{y | y > -5\}$

D) $\{y | y > 5\}$

$y < -5$

$y = 2^{4(x+2)} + 1$

6. Describe the transformation of $y = 2^x$ that produces $y - 1 = (2)^{4(x+2)}$

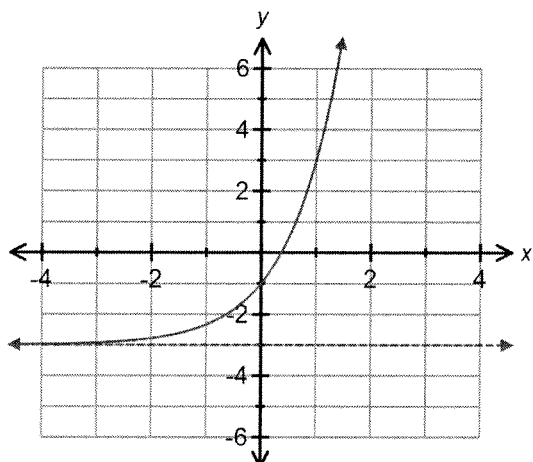
A) vertical translation 1 unit down, horizontal stretch $\frac{1}{4}$, horizontal translation 2 units left

B) vertical translation 1 unit down, horizontal stretch 4, horizontal translation 2 units left

C) vertical translation 1 unit up, horizontal stretch $\frac{1}{4}$, horizontal translation 2 units left

D) vertical translation 1 unit up, horizontal stretch 4, horizontal translation 2 units left

7. Which equation best represents the graph below?



A) $y = 2^x - 3$

B) $y = 3^x - 3$

C) $y = 3(2)^x - 3$

D) $y = 2(3)^x - 3$

y = 2(3)^x - 3

8. What is the equation of the horizontal asymptote of $-4(y + 3) = 2^{x-1}$

A) $y = -3$

B) $y = -\frac{1}{3}$

C) $y = \frac{1}{3}$

D) $y = 3$

y = -\frac{1}{4}(2)^{x-1} - 3

9. A strain of bacteria doubles every 4 hours. If 20 bacteria are present initially, write an equation to represent the number of bacteria present at time t .

A) $y = 20\left(\frac{1}{2}\right)^t$

B) $y = 20(2)^{\frac{t}{4}}$

y = 20(2)^{t/4}

C) $y = 20(2)^t$

D) $y = 20(2)^{4t}$

10. Which best represents the transformation of $y = 5^x$ by the mapping rule

$(x, y) \rightarrow \left(-\frac{1}{3}x - 3, 4y + 2\right)$?

A) $\frac{1}{4}(y - 2) = 5^{-3(x+3)}$

B) $4(y - 2) = 5^{-3(x+3)}$

C) $\frac{1}{4}(y + 2) = 5^{-3(x+3)}$

D) $4(y + 2) = 5^{-3(x+3)}$

y = 4(5)^{-3(x+3)} + 2
\frac{1}{4}(y - 2) = 5^{-3(x+3)}

Part II: Show all workings in the space provided. (22 Marks)

1. A radioactive substance has a half-life of 23 years. If the function $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ models the decay of the substance and 384 grams are present initially, algebraically determine when 12 grams remain. (4 Mks)

12 = 384\left(\frac{1}{2}\right)^{x/23} *5 = \frac{x}{25}*
\frac{1}{32} = \left(\frac{1}{2}\right)^{x/23} *x = 125*
\left(\frac{1}{2}\right)^5 = \left(\frac{1}{2}\right)^{x/23}

2. Sketch the graph of: $y = 2(4)^{-2x-6} - 1$

State the mapping rule, tables of values, domain, range and equation of the horizontal asymptote. (6 Mks)

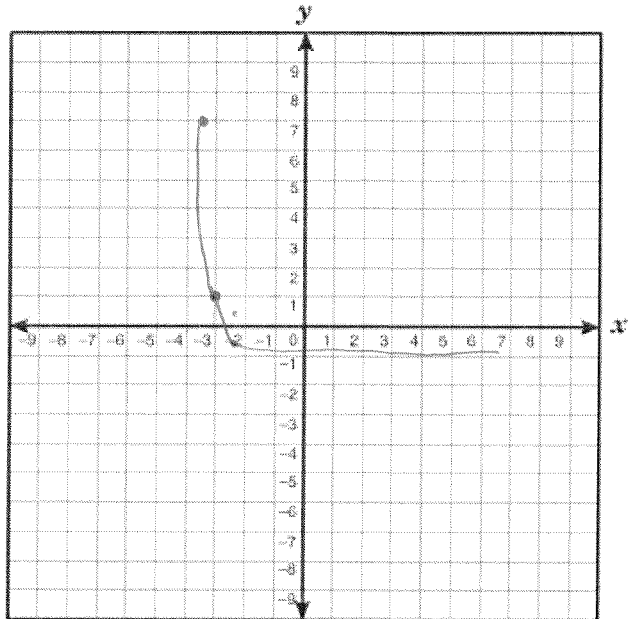
$y = 4^x$

x	y
-1	1/4
0	1
1	4
2	16

$(x, y) \rightarrow (-\frac{1}{2}x - 3, 2y - 1)$

$-\frac{1}{2}x - 3$	$2y - 1$
-2.5	-0.5
-3	1
-3.5	7
-4	31

Domain: $x \in \mathbb{R}$
 Range: $y > -1$
 eqn HA: $y = -1$



3. Solve for x algebraically: (9 Mks)

a) $(\frac{1}{9})^{x-6} = (27)^{2x-1}$ [3]

$(3^{-2})^{x-6} = (3^3)^{2x-1}$

$-2x + 12 = 6x - 3$

$\frac{15}{8} = \frac{8x}{8}$

$x = \frac{15}{8}$

b) $4(5)^{3x+2} = 2500$ [2]

$5^{3x+2} = 625$

$5^{3x+2} = 5^4$

$3x + 2 = 4$

$3x = -2$

$x = -\frac{2}{3}$

c) $\sqrt[3]{16^x} = (\frac{1}{4})^{2x+4}$ [4]

$16^{x/3} = (4^{-1})^{2x+4}$

$(4^2)^{x/3} = 4^{-2x-4}$

$\frac{2x}{3} = -2x - 4$

$\frac{2x}{3} + 2x = -4$

$\frac{8x}{3} = -4$

$8x = -12$

$x = -\frac{3}{2}$

4. \$4000 is invested in an account that earns 6% interest per year compounded semi-annually. Write an equation to model this situation and algebraically determine how much money will be in the account after 6 years. (3 Mks)

$y = 4000 \left(1 + \frac{0.06}{2}\right)^{6(2)}$

$y = \$5703.04$