**SATPREP** **Name** _____

**Assignment : Function and Equation** **Date** _____

**1.** The number of bacteria, $n$, in a dish, after $t$ minutes is given by $n = 800e^{013t}$.

(a) Find the value of $n$ when $t = 0$.

(b) Find the rate at which $n$ is increasing when $t = 15$.

(c) After $k$ minutes, the rate of increase in $n$ is greater than 10 000 bacteria per minute. Find the least value of $k$, where $k \in \mathbb{Z}$.

**2.** Let $g(x) = 3x - 2$, $h(x) = \frac{5x}{x-4}$, $x \neq 4$.

(a) Find an expression for $(h \circ g)(x)$. Simplify your answer.

(b) Solve the equation $(h \circ g)(x) = 0$.

**3.** Each year for the past five years the population of a certain country has increased at a steady rate of 2.7% per annum. The present population is 15.2 million.

(a) What was the population one year ago?

(b) What was the population five years ago?

**4.** A population of bacteria is growing at the rate of 2.3% per minute. How long will it take for the size of the population to double? Give your answer to the nearest minute.

**5.** $1000 is invested at 15% per annum interest, **compounded monthly**. Calculate the minimum number of months required for the value of the investment to exceed $3000.

**6.** The population of a city at the end of 1972 was 250 000. The population increases by 1.3% per year.

(a) Write down the population at the end of 1973.

(b) Find the population at the end of 2002.

**7.** A machine was purchased for $10000. Its value $V$ after $t$ years is given by $V = 100000e^{-0.3t}$. The machine must be replaced at the end of the year in which its value drops below $1500. Determine in how many years the machine will need to be replaced.

**8.** The quadratic function $f$ is defined by $f(x) = 3x^2 - 12x + 11$.

(a) Write $f$ in the form $f(x) = 3(x - h)^2 - k$.

(b) The graph of $f$ is translated 3 units in the positive $x$-direction and 5 units in the positive
$y$-direction. Find the function $g$ for the translated graph, giving your answer in the form
$g(x) = 3(x - p)^2 + q$.

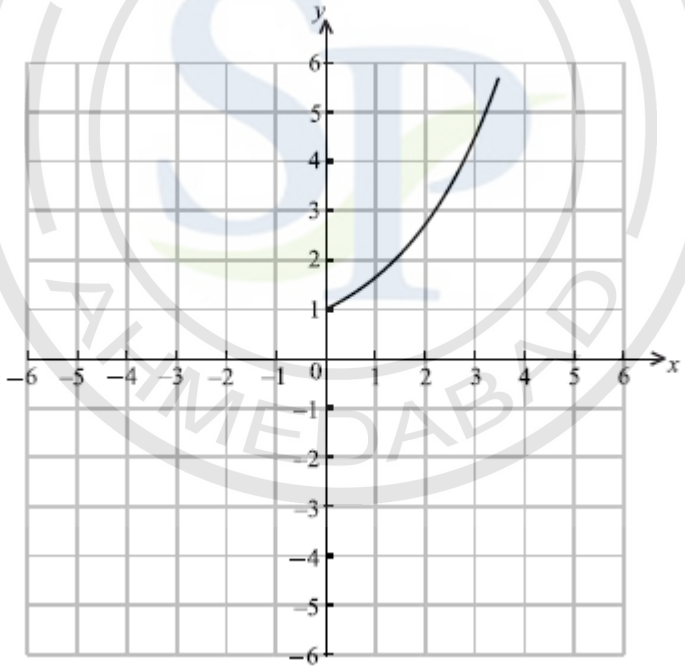
**9.** Let $f(x) = \frac{3x}{2} + 1$, $g(x) = 4\cos\left(\frac{x}{3}\right) - 1$. Let $h(x) = (g \circ f)(x)$.

(a) Find an expression for $h(x)$.

(b) Write down the period of $h$.

(c) Write down the range of $h$.

**10.** Let $f$ be the function given by $f(x) = e^{0.5x}$, $0 \leq x \leq 3.5$. The diagram shows the graph of $f$.




(a) On the same diagram, sketch the graph of $f^{-1}$.

(b) Write down the range of $f^{-1}$.

(c) Find $f^{-1}(x)$.

# Answer to Assignment Function and Equation

**1.** (a) $n = 800e^0$
$n = 800$

(b) $n'(15) = 731$

(c) least value of $k$ is 36

**2.** (a) $\frac{5(3x-2)}{(3x-6)}$

(b) $x = \frac{2}{3}$ $(=0.667)$

**3.** (a) $\frac{15.2}{1.027}$ = 14.8 million

(b) $\frac{15.2}{(1.027)^5}$ = 13.3 million

**4.** 30 minutes (nearest minute)

**5.** $n$ = 89 months.

**6.** (a) 253250

(b) 368000 (accept 368318)

**7.** 7 (years)

**8.** (a) $f(x) = 3(x - 2)^2 - 1$ (accept $h = 2$, $k = 1$)

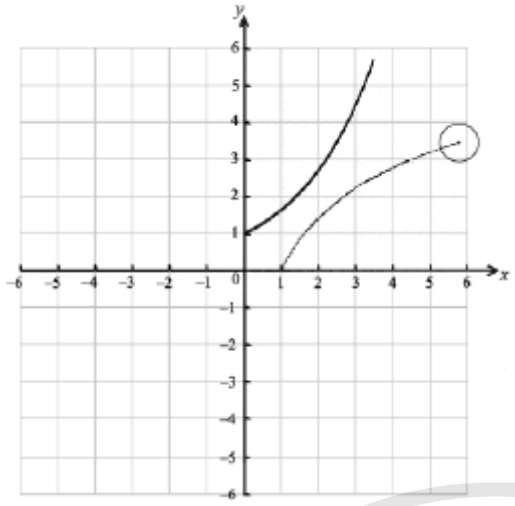
(b) $3(x - 5)^2 + 4$ (accept $p = 5$, $q = 4$)

**9.** (a) $h(x) = 4\cos\left(\frac{\frac{3x}{2}+1}{3}\right) - 1$ $\left(4\cos\left(\frac{1}{2}x + \frac{1}{3}\right) - 1, 4\cos\left(\frac{3x+2}{6}\right) - 1\right)$

(b) period is $4\pi(12.6)$

(c) range is $-5 \le h(x) \le 3$ ($[-5, 3]$)

**10.** (a)




(b) $0 \le y \le 3.5$

(c) $x = e^{0.5y}$

$f^{-1}(x) = 2 \ln x$