Cambridge Senior Mathematical Methods AC/VCE Units 1 & 2
Online Teaching Suite Chapter 13 Exponential functions and logarithms: **Chapter test 1**

Instructions to students: Use your text book to answer this test on Chapter 13.

Due Date: 16-07-2018

Multiple-choice questions

1 The expression $6x^3 \div (3x^{-3})$ equals

A 2

B $2x^0$

C $2x^6$

D $2x^{-1}$

E $\frac{2}{x^9}$

2 The expression $(-a)^2(-a^2)(-a)^3(a)^2$ equals

A a^9

B $-a^9$

C a^8

D $-a^8$

E a^{24}

3 The expression $36(w^2y^3)^2 \div 15(wy^2)^3$ equals

A $\frac{6w}{15}$

B $\frac{12w}{5}$

C $\frac{2y}{5w}$

D $\frac{2w}{5}$

E $\frac{2}{5w}$

4 The function $f : \mathbb{R}^+ \to \mathbb{R}$, where $f(x) = \log_2 5x$, has an inverse function, f^{-1}.

The rule for f^{-1} is given by

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

B $f^{-1}(x) = 5^x$

C $f^{-1}(x) = \left(\frac{1}{5}\right)2^x$

D $f^{-1}(x) = 2^{\frac{x}{5}}$

E $f^{-1}(x) = \log_2\left(\frac{x}{5}\right)$

5 The solution of the equation $4 \times 2^{5x} = 64$ is

A $x = \frac{1}{5}$

B $x = \frac{4}{5}$

C $x = \left(\frac{1}{5}\right)\log_2 60$

D $x = \left(\frac{1}{2}\right)\log_2 16$

E $x = \left(\frac{1}{5}\right)2^5$

6 The equation of the asymptote of $y = 5 \times 2^{x-1} + 4$ is

A $x = 2$

B $y = 0$

C $y = 4$

D $x = 1$

E $y = 5$

7 The equation of the asymptote of $y = 4\log_2(6x) + 3$ is

A $x = 0$

B $x = 2$

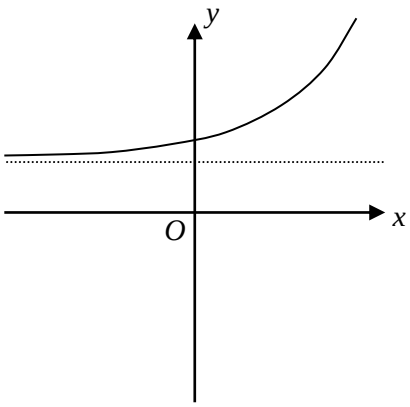
C $x = 3$

D $x = 4$

E $x = \frac{1}{6}$

8 Which of the following graphs could be the graph of the function $f(x) = 2^{ax} + b$, where a and b are negative?

A



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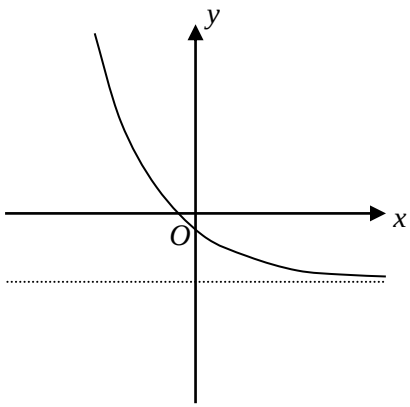

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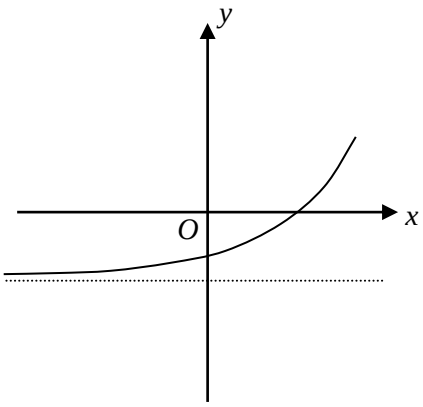

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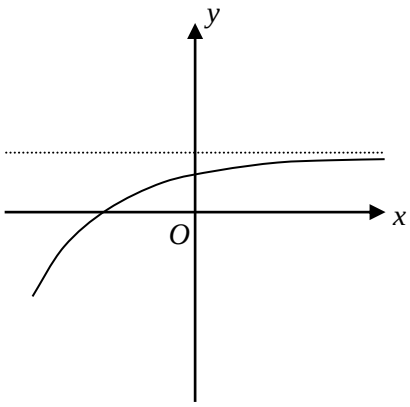
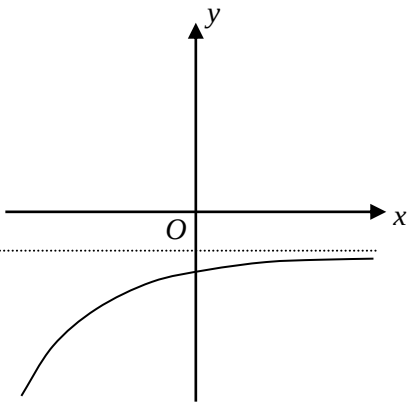


E



9 Which one of the following functions has a graph with a vertical asymptote with equation $x = -b$?

A $y = \log_2(x + b)$

B $y = \dfrac{1}{x - b}$

C $y = \dfrac{1}{x - b} - b$

D $y = 2^x - b$

E $y = 2^{(x - b)}$

10 If $\log_a(x^2) - 4 = 2\log_a 6$, where $a > 0$ and $x > 0$, then

A $x = a^6$

B $x = 2\log_a 6 + 4$

C $x = \dfrac{6}{a}$

D $x = \dfrac{a}{6}$

E $x = 6a^2$

11 If $\log_{10}(x + 2) - \log_{10}(x - 2) = 2$ then

A $x = 98$

B $x = 2^{10} - 5$

C $x = 8$

D $x = 10$

E $x = \dfrac{202}{99}$

12 If $\log_b a = 5$, which of the following statements is always true?

A $a = 5^b$

B $a = b^5$

C $b = a^5$

D $b = a^5$

E $a = 5$

13 The function $f : \mathbb{R} \to \mathbb{R}$, $f(x) = 2 \times 3^{\frac{x}{2}} - 1$ has range

A R

B $R \setminus \{-1\}$

C $(-1, \infty)$

D $(1, \infty)$

E $[1, \infty)$

14 If $\log_3 (3x + 2) = -1$ then:

A $x = 2$

B $x = \frac{-5}{9}$

C $x = -1$

D $x = \frac{-5}{3}$

E $x = \frac{2}{5}$

15 The solution of the equation $3 \times 2^{5x} = 6$, is

A $x = \frac{1}{2}$

B $x = \frac{1}{5}$

C $x = \frac{1}{5} \log_2 10$

D $x = \frac{1}{2} \log_2 5$

E $x = \frac{1}{5} 2^5$

Short-answer questions (technology-free)

1 Solve the following equations for x:

a $3^x = 27$

b $3^{2x} - 10 \times 3^x + 9 = 0$

c $\log_{10}(x) + 2\log_{10}(3) = \log_{10}(12)$

d $\log_2 (x + a) = b$

e $2\log_2 (x) + \log_2 (a) = 0$

2 Sketch the following graphs clearly showing intercepts and asymptotes:

a $y = 2^x - 1$

b $y = 2\log_{10}(3x)$

c $y = \log_{10}(3 - 2x)$

3 Simplify the following:

a $\frac{8a^6}{6a^3} \div \frac{4(a^2)^4}{(3a)^3}$

b $\frac{(3a^3)}{6a^{-1}}$

4 Simplify the expression $\log_2 12 + \log_2 10 - \log_2 15$.

5 If $3 + \log_2(4x) = \log_2(y)$, find y in terms of x.

6 Find the set of values of t for which $4 \times 2^{0.2t} > 2$.

Extended-response question

The size of a population of rabbits is determined by the rule $P = 6400 \times 3^{0.2t} - 400$, where P is the size of the population t years after January 2006.

a Find the size of the population when:

i $t = 0$ **ii** $t = 10$

b After how many years does the size of the population exceed 1 000 000?

c Sketch the graph of P against t.