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# PRACTICE EXAM 1

## PART 1 / MULTIPLE-CHOICE QUESTIONS

### INSTRUCTIONS

**Select the response that is correct for the question.**
**A correct answer scores 1 mark, an incorrect answer scores 0.**
**Marks will not be deducted for incorrect answers.**
**If more than one answer is selected no marks will be awarded.**

### Question 1

The range of the function $f(x) = x^3 - 5x^2 + 3x + 9$, $x \in (0,5]$ is

**A.** $(0,5]$
**B.** $(9,24)$
**C.** $[9,24]$
**D.** $(0,24]$
**E.** $[0,24]$

### Question 2

The equations of the asymptotes of the graph with the rule $y = \dfrac{-3x-1}{x+1}$ are

**A.** $x = -1, y = -3$
**B.** $x = 1, y = -3$
**C.** $x = -1, y = 0$
**D.** $x = 1, y = -1$
**E.** $x = -1, y = \dfrac{1}{3}$

### Question 3

The number of solutions to the equation $(x^2 - a)(x^3 - b^3)(x + c) = 0$ where $a, b, c \in R^+$ is

**A.** 6
**B.** 5
**C.** 4
**D.** 3
**E.** 2

### Question 4

Given that $\log_2 c + \log_2 5 = 3\log_2 3$, then $c$ is equal to

**A.** 22
**B.** 1.8
**C.** $2^{5.4}$
**D.** 5.4
**E.** 4

### Question 5

The curve with equation $f(x) = x^3 - bx^2 - 9x + 7$ has a stationary point when $x = -1$.
The value of $b$ is

**A.** $-3$
**B.** 3
**C.** $-\dfrac{1}{2}$
**D.** 2
**E.** 6

### Question 22: E

$\Pr(X > a) = \int_a^1 3x^2\,dx = 0.875$

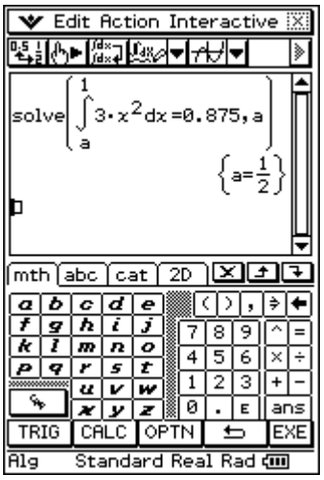
$\left[x^3\right]_a^1 = 0.875$

$1 - a^3 = 0.875$

$a^3 = 0.125$

$a = 0.5$

**Using a CAS calculator and solving for $a$ gives—**




## PART 2

### Question 1a — 2 marks

Completing the square gives
$x^2 - 8x + 16 - 16 + 25$
$= (x - 4)^2 + 9$
$(x - 4)^2 \geq 0$ so $(x - 4)^2 + 9 > 0$

**TIP**
other techniques can also be used such as graphing or using the discriminant.

**Mark allocation**
1 mark for valid method
1 mark for valid conclusion

### Question 1b — 1 mark

As $x^2 - 8x + 25 > 0$ there are no solutions from this quadratic, therefore the only $x$-intercepts come from the two linear factors $x$ and $(x-7)$. The $x$-intercepts are at $x = 0$ and $x = 7$.

**Mark allocation**
1 mark for correct intercepts.

### Question 1c — 1 mark

$y_b$ is the graph of $y$ shifted up 16 units. This gives the equation

$$y_b = \frac{1}{35}x(x - 7)(x^2 - 8x + 25) + 16$$

**Mark allocation**
1 mark for the correct equation.

### Question 1d — 2 marks

The transformations are—a reflection in the $x$-axis and a translation of 20 units up.

**Mark allocation**
1 mark for stating one transformation correctly
1 mark for stating the second transformation correctly and in correct order.

### Question 1e — 2 marks

Endpoints are at (0, 16), (9, 33.49), (0, 20), (9, 2.51) and these can be obtained using the table facility on the calculator or by using value.

**Mark allocation**
1 mark for 2 correct endpoints.
2 marks for all endpoints correct.

### Question 1f — 1 mark

Using a calculator and finding the point of intersection gives—(7.45, 18)

**Mark allocation**
1 mark for correct answer.

### Question 1g — 2 marks

At $x = 5$, $y_b = 13.143$ and $y_T = 22.857$, a difference of 9.71cm

These values can be obtained from the table or by using value on the calculator.

**Mark allocation**
1 mark for the y values
1 mark for the correct length.

### Question 1h — 2 marks

Set up an equation that is the difference between $y_T$ and $y_b$, $(y = y_T - y_b)$, and use the graph to intersect with the lines $y = 5$ and $y = -5$

There are three points of intersection at $x = 0.105, 6.851, 7.844$

**Mark allocation**
1 mark for indicating an appropriate method—i.e. setting up the difference equation
1 mark for the correct $x$ values.

### Question 1i — 2 marks

Using the equation above $(y = y_T - y_b)$ find the maximum and minimum value of the function—
$y_{max} = 11.43$ $y_{min} = -30.97$. So the greatest distance between the graphs is 30.97 cm—therefore the maximum vertical web length is 30.97 cm.

**Mark allocation**
1 mark for indicating a valid method—(if student gives answer of 11.43 cm, then 1 mark)
1 mark for correct answer.

**Total 15 marks**

### Question 2a — 1 mark

asymptote at $x = 5$

**Mark allocation**
1 mark for answer