TRINITY COLLEGE

Mathematics Methods Units 3,4
Test 4 2019

Section 1 Calculator Free

Logarithms

STUDENT'S NAME _____

DATE: Tuesday 2 July **TIME:** 40 minutes **MARKS**: 42

INSTRUCTIONS:
Standard Items: Pens, pencils, drawing templates, eraser

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

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1. (7 marks)

(a) Solve exactly $e^{2x} + 3e^{x} - 10 = 0$ [4]

(b) Solve $\log_5 x^2 - \log_5 \frac{1}{x} = 6$ [3]

2. (8 marks)

(a) $\frac{d}{dx} e^{x^2 - x} \ln 2$ [2]

(b) $\frac{d}{dx} \frac{1}{\ln(x^2 - 1)}$ [3]

(c) $\frac{d}{dx} \log_6 5x^e$ [3]

3. (10 marks)

(a) $\int \frac{3x^4 - 5}{x} dx$ [2]

(b) $\int_1^0 \frac{-2 + x}{-3x^2 + 12x + 1} dx$ [4]

(c) $\int_0^{\frac{\pi}{4}} \frac{\sin 2x}{1 + 5\cos 2x} dx$ [4]

4. (7 marks)

Given that $\log_t 3 = x$ and $\log_t 10 = y$, then determine in terms of x and y, the values of each of the following.

(a) $\log_t 30$ [1]

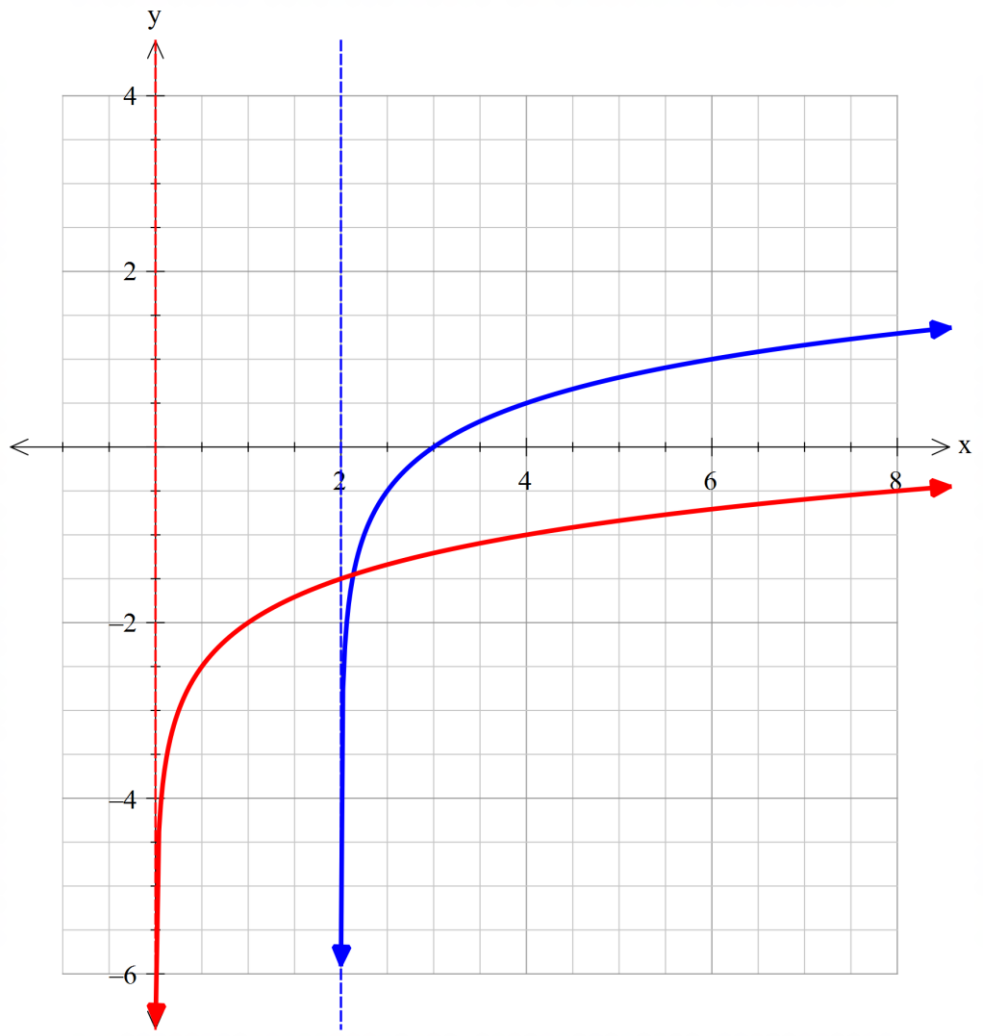
(b) $\log_t 2.7$ [1]

(c) $\log_t 3t^2$ [2]

(d) $\log_t \frac{9t}{\sqrt{1000}}$ [3]

5. (3 marks)

The graphs shown below are for the functions $y = \log_a(x+b)$ and $y = \log_a x + c$. Determine the value a, b and c.



6. (7 marks)

(a) Determine $\frac{d}{dx} x^2 \ln x$ [2]

(b) Using the result of (a) or otherwise, determine exactly $\int_1^e (2x \ln x) dx$ [5]

TRINITY COLLEGE

Mathematics Methods Units 3,4
Test 4 2019

Section 2 Calculator Assumed

Logarithms

STUDENT'S NAME _____

DATE: Tuesday 2 July **TIME:** 12 minutes **MARKS**: 12

INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser

Special Items: Three calculators, notes on one side of a single A4 page (these notes to be handed in with this assessment)

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

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7. (7 marks)

The displacement, x cm, of a body from the origin after t seconds can be calculated by $x = 3t^2 - 12\ln t + 1 \qquad t > 0$

Determine

(a) the displacement and acceleration when $t = 2$ [4]

(b) the time when the body comes to rest [1]

(c) the distance travelled between $t = 1$ and $t = 2$ [2]

8. (5 marks)

The approximate apparent magnitudes of two heavenly bodies are listed in the table below.

Heavenly body	Apparent magnitude m
Sirius	–1.5
Antares	1

The ratio of brightness (or intensity) $\frac{I_A}{I_B}$ of two objects A and B of apparent magnitudes m_A and m_B respectively, satisfies the equation $\ln\left(\frac{I_A}{I_B}\right) = m_B - m_A$

(a) Determine the ratio of the brightness of Sirius to Antares $\frac{I_S}{I_A}$. [2]

(b) If the ration of $\frac{I_{Jupiter}}{I_{Sirius}}$ is $\sqrt{e}$, determine the apparent magnitude of Jupiter. [3]