UNIVERSITY OF MALTA
L-Università ta' Malta
Junior College

Mathematics Department
Advanced Pure Mathematics End-of-Year Test

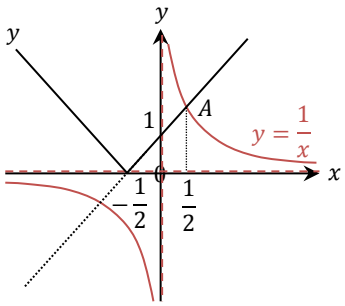
June 2017 – Answers

1. (a) (i) $1 - 6x + 12x^2 - 8x^3$ (ii) -1 or $\frac{3}{8}$

   (b) $x = \left(\frac{2}{a}\right)^{\frac{2}{3}}$

2. (b) (ii) $21x^2 - 13x + 2 = 0$

3. (a) $-2 \leq x \leq 1\,,\ x \geq 3$

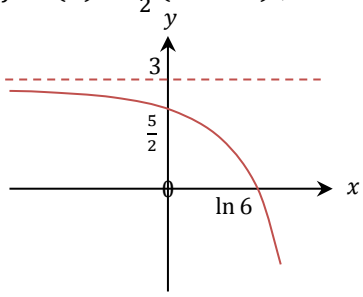
   (b) (i) 

   (ii) $0 < x < \frac{1}{2}$

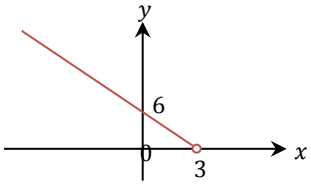
4. (a) $(x-3)^2 + (y+1)^2 = 10$ (b) $4, -16$

5. (b) $\frac{\pi}{4}\,, 1.249^c\,, \frac{5\pi}{4},\ 4.391^c$

6. (a) $f^{-1}(x) = \frac{1}{2}(6 - e^x)$; dom f^{-1}: $x \in R$; ran f^{-1}: $f^{-1}(x) \in R, f^{-1}(x) < 3$

   (b) 

   (c) $gf(x) = 6 - 2x$; $x \in R, x < 3$

   (d) 

   range gf: $gf(x) \in R^+$

7. (a) (i) $6\sec^3 2x \tan 2x$ (ii) $\frac{4e^{4x}-3x^2-2y^3}{6xy^2-2y}$

(b) (i) $r = \frac{h}{5}$ cm (iii) $\frac{125}{18\pi}$ cm/s

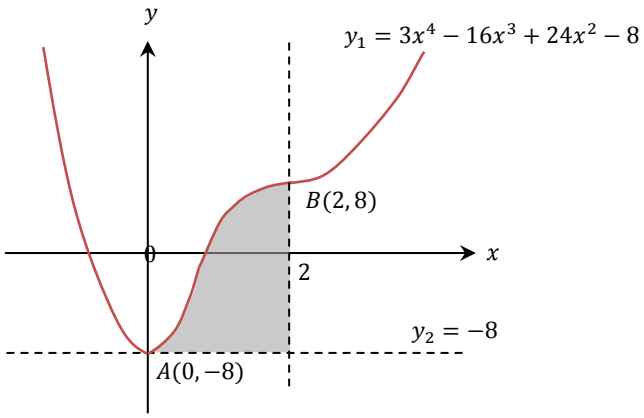
8. (a) $81.67°$

(b) (i) $\frac{9}{2}$ (ii) $\frac{4}{5}$ (iii) 16 (iv) 964.82

9. (a) (i) $\ln|x| - \frac{2}{x} - \frac{1}{2x^2} + k$ (ii) $\ln\left(\frac{8}{3}\right)$

(b) $49x^7 \tan y = -7\ln x - 1 + x^7$

10. (a) $A(0,-8)$ minimum; $B(2,8)$inflexion



(b) $\frac{96}{5}$ units^2