



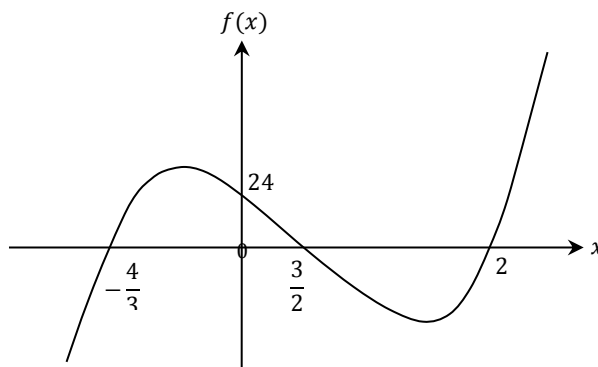
**UNIVERSITY OF MALTA**  
**L-Universitá ta' Malta**  
**Junior College**

**Mathematics Department**  
**Advanced Pure Mathematics End-of-Year Test**

**June 2016 – Answers**

1. (a)  $1 - \frac{x}{2} + \frac{x^2}{10} - \frac{x^3}{100}$ ; 0.95099  
(b)  $x = 1, y = 4$

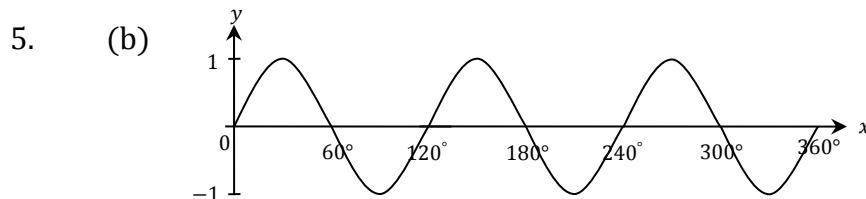
2. (i)  $p = -13, = -10; (x - 2)(3x + 4)(2x - 3)$   
(ii)



- (iii)  $-\frac{4}{3} < x < \frac{3}{2}, x > 2$

3. (i)  $3y = 4x + 23$   
(ii)  $C(1, 9)$   
(iii)  $(x - 1)^2 + (y - 9)^2 = 25$   
(iv)  $D(-3, 12)$

4. (ii)  $x^2 + 16x - 8 = 0$

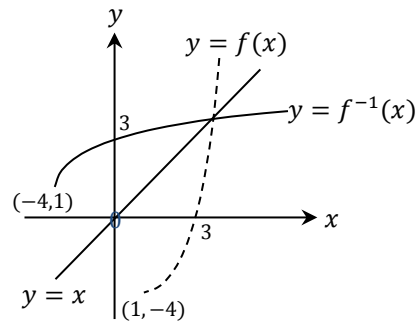


$$0^\circ \leq \theta \leq 60^\circ$$

$$120^\circ \leq \theta \leq 180^\circ$$

$$240^\circ \leq \theta \leq 300^\circ$$

6. (i)  $f(x) \geq -4$   
(ii)  $f^{-1}(x) = 1 + \sqrt{x+4}$ ,  $x \geq -4$ ; range  $f^{-1}$ :  $f^{-1}(x) \geq 1$   
(iii)



- (iv)  $gf(x) = |x^2 - 2x - 7|$ ,  $x \geq 1$   
(v)  $x = 1$  (twice)
7. (a) (i)  $x(3x \cos 3x + 2 \sin 3x)$   
(ii)  $\frac{2(3x-1)(3x+16)}{(2x+5)^2}$   
(c)  $5y = 4x + 1$
8. (a) (i)  $\frac{1}{3}$ ; 243  
(ii)  $S_{\infty}$  exists since  $-1 < r < 1$ ;  $\frac{729}{2}$   
(b) (i) 5; 25
9. (a) (i)  $\frac{1}{4}(2\theta - \sin 2\theta) + k$   
(ii)  $\frac{x^3}{9}(3 \ln x - 1) + k$   
(b)  $2 \ln \left| \frac{3y^2-1}{2} \right| = 3 \sin^4 x$
10. (i)  $-1$ ;  $\frac{1}{2}$ ;  $\frac{5}{2}$   
(ii)  $-2 + 3 \ln 3$