Part A Multiple Choice

All questions in this part are worth 1 marks each. (Total 25 marks)
***USE SCANTRON CARD

1. **The point (9, -12) is on the graph of a function. What will the coordinates of this point be after all of the following transformations.**

   - horizontal expansion by a factor of 3
   - reflection in the x-axis
   - vertical translation of 5 downward

$y = -f\left(\frac{1}{3}x\right) - 5 \rightarrow$

$3x$	$-y-5$
$3(9)$	$-(-12)-5$
27	7

A (-27, 7) **B** (3, 7) **C** (27, 7) **D** (-3, 7)

2. **Determine an equation of the inverse of $f(x) = 2x + 6$.**

$x = 2y + 6$

$\frac{x}{2} - \frac{6}{2} = \frac{2y}{2}$

$\frac{1}{2}x - 3$

A $f^{-1}(x) = \frac{1}{2}x - 3$ **B** $f^{-1}(x) = \frac{1}{2x+6}$ **C** $f^{-1}(x) = -2x - 6$ **D** $f^{-1}(x) = \frac{1}{2}x + \frac{1}{6}$

3. **Which value is NOT a zero of $P(x) = x^3 + 3x^2 - x - 3$?**

$(3)^3 + 3(3)^2 - (3) - 3 \neq 0$

A 1 **B** -1 **C** 3 **D** -3

4. **Determine the value of k if the remainder is 2 for $(4x^3 - kx^2 + 2x + 1) \div (x - 1)$**

$4(1)^3 - k(1)^2 + 2(1) + 1 = 2$

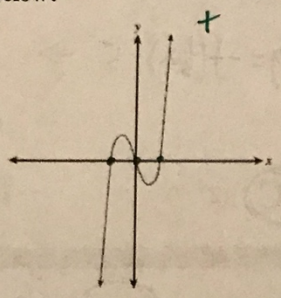
$4 - k + 2 + 1 = 2$

$7 - k = 2$

A 5 **B** 9 **C** -7 **D** 1

Part A Multiple Choice All questions in this part are worth 1 marks each. (Total 22 marks)

5. If a, b, c, d, and g are real numbers and $a > 0$, which equation could be represented by the curve below?



A $y = ax^4 + bx^3 + cx + g$ **B** $y = ax^2 + bx + cx + d$

C $y = ax + b$ **D** $y = ax^3 + bx^2 + cx + d$

6. Solve for x: $\left(\frac{1}{9}\right)^x = 27^{2-x}$.

$3^{-2(x)} = 3^{3(2-x)}$

$-2x = 6 - 3x$

A -6 **B** $\frac{6}{5}$ **C** 2 **D** 6

7. Determine an equivalent expression for $\log a + 2\log b - 3\log c$

$\log a + \log b^2 - \log c^3 \rightarrow \log \frac{ab^2}{c^3}$

A $\log\frac{ab^2}{c^3}$ **B** $\log\frac{a}{b^2c^3}$ **C** $\log\frac{a}{6bc}$ **D** $\log\frac{2ab}{3c}$

8. Give the domain of $f(x) = \log_7(x + 6) + 12$

Argument must be >0

$x + 6 > 0$

$x > -6$

A $x > 6$ **B** $x > -6$ **C** $x > 12$ **D** $x > -12$

Part A Multiple Choice All questions in this part are worth 1 marks each. (Total 22 marks)

9. The 4th term of a geometric sequence is 250 and the 7th term is -16. Determine the 10th term.

$- - - \; [250 \; - - \; -16]$, t_4, t_7

$t_n = t_1 (r)^{n-1}$

$-16 = 250 (r)^3$

$r = \frac{-2}{5}$

A $-\frac{2}{5}$ B $\frac{2}{5}$ C $-\frac{128}{125}$ (D) $\frac{128}{125}$

10. Evaluate

$$\sum_{k=3}^{12} 32\left(-\frac{1}{2}\right)^k$$

$r = -\frac{1}{2}$

$t_3 = -4$

$t_{12} = \frac{1}{128}$

$S_n = \frac{\left[\left(-\frac{1}{2}\right)\left(\frac{1}{128}\right) + 4\right]}{\left(-\frac{1}{2} - 1\right)}$

(A) -2.66 B -21.31 C 2.67 D 21.35

11. If $f(x) = x^2 - 16$ and $g(x) = x + 4$, find the domain of $\frac{f}{g}(x)$.

$\frac{x^2 - 16}{x+4} \rightarrow \frac{(x+4)(x-4)}{(x+4)}$

POD $(-4, -8)$

D: $x \in R \; x \neq -4$

A $x \in R, x \neq 0$ B $x \in R, x \neq 4$ (C) $x \in R, x \neq -4$ D $x \in R$

12. If $h(x) = x^2$ and $g(x) = 3x^2 - 1$ find the equation for $(hg)(x)$.

$x^2(3x^2 - 1)$

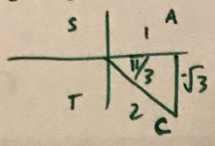
$3x^4 - x^2$

A $(3x^2 - 1)^2$ B $3x^4 - 1$ (C) $3x^4 - x^2$ D $9x^4 + 1$

Part A Multiple Choice All questions in this part are worth 1 marks each. (Total 22 marks)

13. **Find the exact value of** $\tan\frac{5\pi}{3}$.

$\frac{\pi}{3} = 60 \times 5 = 300$

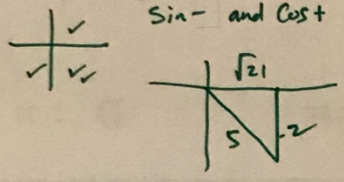


$\tan\frac{O}{A} = \frac{-\sqrt{3}}{1}$

A $-\sqrt{3}$ **B** $\frac{1}{\sqrt{3}}$ **C** $-\frac{1}{\sqrt{3}}$ **D** $\sqrt{3}$

14. **If** $\sin A = \frac{-2}{5}$ **and** $\cos > 0$ **find the exact value(s) of** $\cot A$. → $\frac{A}{O} = \frac{\sqrt{21}}{-2}$

Sin− and Cos+



$\sqrt{5^2 - 2^2}$

$\sqrt{21}$

A $-\frac{2}{\sqrt{21}}$ **B** $\frac{2}{\sqrt{21}}$ **C** $\frac{\sqrt{21}}{2}$ **D** $-\frac{\sqrt{21}}{2}$

15. **A circle has a radius of 12 cm. If the central angle is 45°, determine the length of the arc?**

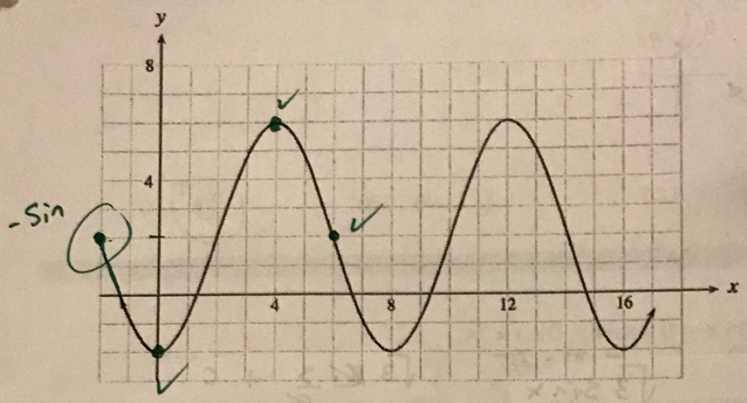
$A = \theta r$ ↳ Change to Radian $\frac{\pi}{4}$

$\frac{\pi}{4} \cdot 12 = 3\pi$

A 2π **B** 3π **C** 4π **D** 6π

Part A Multiple Choice All questions in this part are worth 1 marks each. (Total 22 marks)

16. Which function is NOT an equation for the following graph.



-Sin

A $y = 4Cos\frac{\pi}{4}(x-4)+2$ R4 **B** $y = 4Sin\frac{\pi}{4}(x+2)+2$ L2 **C** $y = -4Sin\frac{\pi}{4}(x-6)+2$ R6 **D** $y = -4Cos\frac{\pi}{4}x+2$

0

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17. Which expression is equivalent to $\sin(\pi + 2x)$?

$\sin(A+B) \rightarrow \sin A\cos B + \cos A \sin B$

$\sin\pi \cos 2x + \cos\pi \sin 2x$

$(0)\cdot\cos 2x \quad (-1)\cdot\sin 2x$

$-\sin 2x$

$-2\sin x\cos x$

-100 CST

A $2\cos^2 x - 1$ **B** $1 - 2\cos^2 x$ **C** $2\sin x\cos x$ **D** $-2\sin x\cos x$

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18. Write the expression $\frac{2\tan(8x)}{1-\tan^2(8x)}$? $=$ $\tan 2x$

$\tan 2(8x)$

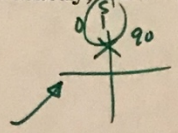
A $\tan(16x)$ **B** $2\tan(16x)$ **C** $2\tan(8x)$ **D** $\tan(8x)$

Part A Multiple Choice All questions in this part are worth 1 marks each. (Total 22 marks)

19. Solve $2\sin x - 2 = 0$ **exactly,** $0° \le x < 360°$.

$2\sin x = 2$

$\sin x = 1$

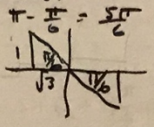


A $0°$ **B** $0°, 180°$ **C** $90°, 270°$ **D** $90°$

20. Solve $\sqrt{3}\cos x \tan x + \cos x = 0$ **exactly,** $0 \le x < 2\pi$.

$\cos x(\sqrt{3}\tan x + 1) = 0$

$\cos x = 0$ $\quad \tan x = \frac{-1}{\sqrt{3}}$

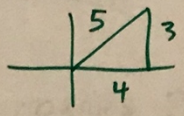


$\pi/2$, $3\pi/2$

$\pi - \frac{\pi}{6} = \frac{5\pi}{6}$ $\quad 2\pi - \frac{\pi}{6} = \frac{11\pi}{6}$

A $\frac{\pi}{6}, \frac{7\pi}{6}$ **B** $\frac{5\pi}{6}, \frac{11\pi}{6}$ **C** $\frac{\pi}{6}, \frac{7\pi}{6}, \frac{\pi}{2}, \frac{3\pi}{2}$ **D** $\frac{5\pi}{6}, \frac{11\pi}{6}, \frac{\pi}{2}, \frac{3\pi}{2}$

21. If $\sin A = \frac{3}{5}$ **and angle A terminates in quadrant I, find the exact value of** $\cos 2A$.



$1 - 2s^2$

$1 - 2\left(\frac{3}{5}\right)^2$

A $\frac{-7}{25}$ **B** $\frac{-4}{25}$ **C** $\frac{4}{25}$ **D** $\frac{7}{25}$

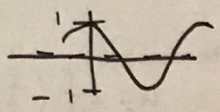
22. Write the expression $\frac{\csc^2\theta}{\sec^2\theta}$ **as a single term.**

$\frac{\frac{1}{s^2}}{\frac{1}{c^2}}$ $\quad \frac{1}{s^2} \cdot \frac{c^2}{1} = \frac{c^2}{s^2}$

A $\cos^2\theta$ **B** $\cot^2\theta$ **C** $\tan^2\theta$ **D** $\sin^2\theta$

Part A Multiple Choice All questions in this part are worth 1 marks each. (Total 22 marks)

23. What is the range of the graph $y = \cos x$. A= 1 D= 0



A $-1 \le y \le 1$ **B** $0 \le y \le 2\pi$ **C** $-2\pi \le y \le 2\pi$ **D** $y \in R$

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24. Write as a single trigonometric function: $6 - (12\sin^2(4x))$

$1 - 2\sin^2 x$ = 6 Sin 2x 4

6 Sin 8x

A $6\cos 4x$ **B** $12\cos 8x$ **C** $6\cos 8x$ **D** $2\cos 4x$

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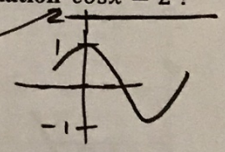
25. How many solution(s) are there in the interval $0 \le x < \pi$ for the equation $\cos x = 2$?

A= 1

D= 0



This line doesn't interse the cos wa

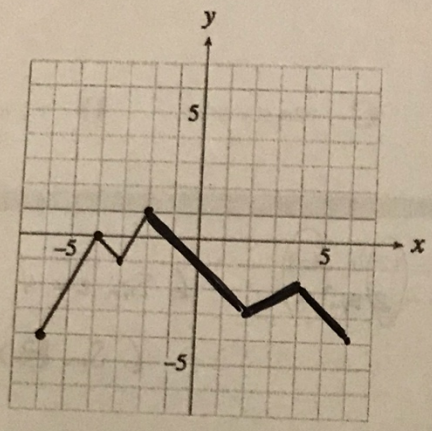
A 0 **B** 1 **C** 2 **D** 3

Part B Written Response Please show all working for full credit. All questions in this part are worth 5 marks each.

1. The graph of $y = f(x)$ is shown below by the line.

a) Graph $y + 3 = -f\left(\frac{1}{2}x + 5\right)$ on the same grid.

$y = -f\left(\frac{1}{2}(x+10)\right) - 3$



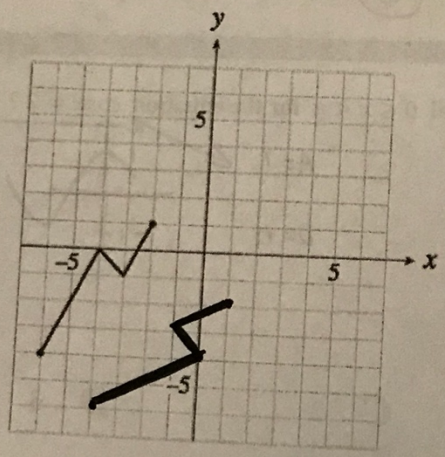
x	y
-6	-4
-4	0
-3	-1
-2	1

$2x+10$	$-y-3$
-2	1
2	-3
4	-2
6	-4

3

b) Graph $y = f^{-1}(x)$ on the grid provided.

$f^{-1}(x)$



x	y
-6	-4
-4	0
-3	-1
-2	1

x	y
-4	-6
0	-4
-1	-3
1	-2

2

Part B Written Response Please show all working for full credit. All questions in this part are worth 5 marks each.

2. **A radioactive substance has a half-life of 17 days. How long will it take for 300 g of this substance to decay to 95 g?**

(Solve algebraically using logarithms. Answer accurate to 2 decimal places)

$$F = S(G)^{t/p}$$

$$\frac{95}{300} = \frac{300}{300}\left(\frac{1}{2}\right)^{t/17} \rightarrow \frac{19}{60} = \left(\frac{1}{2}\right)^{t/17}$$

$$\log\left(\frac{19}{60}\right) = \log\left(\frac{1}{2}\right)^{t/17}$$

$$17\log\left(\frac{19}{60}\right) = \frac{t}{17}\log\left(\frac{1}{2}\right)$$

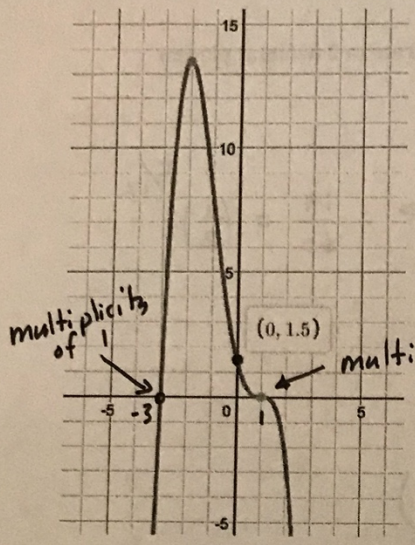
$$\frac{17\log\left(\frac{19}{60}\right)}{\log\left(\frac{1}{2}\right)} = \frac{t\log\left(\frac{1}{2}\right)}{\log\left(\frac{1}{2}\right)}$$

$$t = 28.20$$

2. 28.20 days

Part B Written Response Please show all working for full credit. All questions in this part are worth 5 marks each.

3. Write a polynomial equation for the given graph.



$y = a(x+3)(x-1)^3$

$1.5 = a(0+3)(0-1)^3$

$1.5 = a(3)(-1)$

$\frac{1.5}{-3} = \frac{-3a}{-3}$

$a = -\frac{1}{2}$

3. $y = -\frac{1}{2}(x+3)(x-1)^3$

Part B Written Response Please show all working for full credit. All questions in this part are worth 5 marks each.

4. Given: series $2 + 8 + 14 + 20 + 26 + 32$

a) Write in sigma notation.
b) Find its sum.

Arith. $d = 6$

$t_n = t_1 + (n-1)d$

$t_n = 2 + (n-1)6$

$2 + 6n - 6$

$6n - 4$

a) $\sum_{n=1}^{6} 6n - 4$

b) $n = 6$

$t_1 = 2$

$t_n = 32$

$\rightarrow S_n = \frac{n}{2}(t_1 + t_n)$

$\frac{6}{2}(2 + 32)$

$= 102$

4.

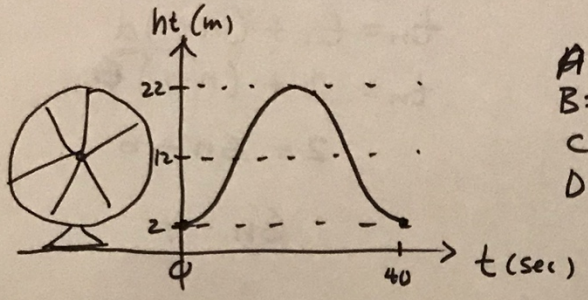
ANSWER:

a) $\sum_{n=1}^{6} 6n - 4$

b) $S_6 = 102$

Part B Written Response Please show all working for full credit. All questions in this part are worth 5 marks each.

5. **A Ferris wheel has a radius of 10 m and its 2 m above the ground. It rotates once every 40 seconds. If Jet gets on this ride at the lowest point determine the height in metres, when Jet has been on the ride for 8 seconds.**



$A = 10$
$B = \frac{\pi}{20}$ $P = 40$
$C = 0$
$D = 12$

$$h(t) = -10 \cos \frac{\pi}{20} t + 12$$

$$-10 \cos \frac{\pi}{20} (8) + 12$$

$$= 8.91 \text{ m}$$

5. 8.91 m

Part B Written Response Please show all working for full credit. All questions in this part are worth 5 marks each.

6. a) Solve the following equation algebraically giving exact values where possible.

$2sin^2x + 5sinx - 3 = 0,\ 0 \le x < 2\pi$

$2s^2 + 5s - 3 = 0$

$(2s - 1)(2s + 6)$ / 2

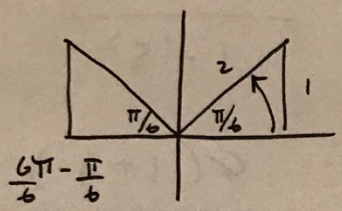
$(2s-1)(s+3)$

-6

1	6
2	3

$\sin x = \frac{1}{2}$ (O, H)

$\sin x = -\frac{3}{1}$ (O, H) hyp can't be less than opp



$\frac{6\pi}{6} - \frac{\pi}{6}$

6a. $\frac{\pi}{6}, \frac{5\pi}{6}$

b) Find the solution to the above equation in over the real numbers.

$+ 2\pi n \quad n \in I$

6b.

Part B Written Response Please show all working for full credit. All questions in this part are worth 5 marks each.

7. Prove the identity:

$$\sec x + \tan x = \frac{\cos x}{1-\sin x}$$

LEFT SIDE	RIGHT SIDE
$\frac{1}{c} + \frac{s}{c}$	$\frac{c}{(1-s)(1+s)}(1+s)$
$\frac{1+s}{c}$	$\frac{c(1+s)}{1-s^2}$
	$\frac{c(1+s)}{c^2}$
	$\frac{1+s}{c}$