Assessment Schedule – 2013

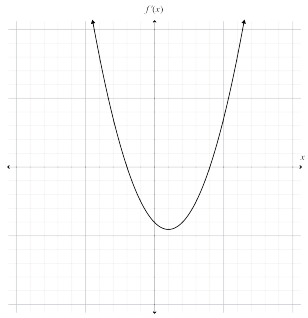
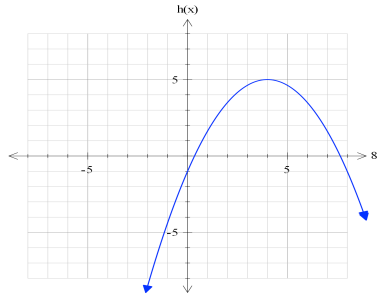
Mathematics and Statistics: Apply calculus methods in solving problems (91262)

Evidence Statement

ONE		Achievement	Merit	Excellence
		Apply calculus methods in solving problems.	Apply calculus methods, using relational thinking, in solving problems.	Apply calculus methods, using extended abstract thinking, in solving problems.
(a)	$f'(x) = 8x - 5$ $f'(3) = 19$	Derivative found and gradient found.		
(b)	$g(x) = \frac{6x^3}{3} - 5x + 7$	Anti-derivative and function found OR equivalent.		
(c)	$h'(t) = 90 - 10t = 0$ $t = 9$ $h(9) = 407$	Derivative found and equated to 0.	Time for maximum and the height found. Units not required.	
(d)	$g'(t) = -0.01t + 0.15$ $= 0.04$ t = 11	Derivative found and equated to 0.04.	Time calculated. Units not required.	
(e)	$g'(x) = -3x^2 + 3 = 0$ $3(1 + x)(1 - x) = 0$ $x = -1, 1$ $x < -1,\ x > 1$ Check gradient: $g'(0) = 3 > 0 \implies$ increasing. OR shape of graph –ve cubic.	Derivative found and = 0 or < 0.	x values of turning point found.	Regions correctly identified and justified.
(f)	$f(x) = \frac{mx^2}{2} + 2x + c$ $10 = 2m + 4 + c$ $c = 6 - 2m$ $-8 = \frac{m}{2} - 2 + c$ $c = -6 - \frac{m}{2}$ $-6 - \frac{m}{2} = 6 - 2m$ $\Rightarrow m = 8$ $f(x) = 4x^2 + 2x + c$ $10 = 16 + 4 + c$ $c = -10$ $f(x) = 4x^2 + 2x - 10$	Equation found in terms of m and equated to 10.	Value of m or c found.	Equation of curve found.

NØ no response; no relevant evidence
N1 attempt at one question
N2 1 of u
A3 2 of u
A4 3 of u
M5 1 of r
M6 2 of r
E7 1 of t
E8 2 of t

Evidence Statement

TWO		Achievement	Merit	Excellence
(a)		Correct curve and x intercepts, and y intercept negative.		
(b)	$d'(t) = \frac{1}{2}t + 1$ $d'(5) = 3.5$	Derivative and rate found. Units not required		
(c)	$\frac{dA}{dr} = 2\pi r$ For given area $r = 7$ Rate of change = 14π or 43.99.	Derivative found and attempt to find r using the correct equation.	r found and rate of change calculated.	
(d)		–ve parabola.	Negative parabola with maximum at (4,5).	Correct parabola and passing through intercept (0,–1).
(e)	$6x^2 - 12x = 0$ $6x(x - 2) = 0$ $x = 0, 2$ Min at $x = 2$ Hence passes through (2,10) $y = 2x^3 - 6x^2 + c$ $10 = 2 \times 8 - 24 + c$ $c = 18$ $y = 2x^3 - 6x^2 + 18$	x values of turning points identified. OR Correct integration set equal to 10.	Minimum turning point at $x = 2$ identified and justified and the point (2,10) use	Equation of curve found.
(f)	$v = -0.04t^2 + c$ $5 = -0.04 \times 3^2 + c \implies c = 5.36$ $s = \frac{-0.04t^3}{3} + 5.36t + c$ $c = 0$ $-0.04t^2 + 5.36 = 0$ $t^2 = 134$ $t = 11.58$ $s(11.58) = 41.4$	Velocity function formed.	Distance function formed.	Distance found.

NØ no response; no relevant evidence
N1 attempt at one question
N2 1 of u
A3 2 of u
A4 3 of u
M5 1 of r
M6 2 of r
E7 1 of t
E8 2 of t

Evidence Statement

THREE		Achievement	Merit	Excellence
(a)	$f(x) = 2x^2 + 3x + c$ $c = 0$ $f(-3) = 9$ Hence $(-3,9)$	Anti-derivative given and point found.		
(b)(i)	$g'(x) = x - 5 = 2$ $x = 7$	Gradient function and solution found.		
(b)(ii)	$g'(8) = 8 - 5 = 3$ $y + 8 = 3(x - 8)$ $y = 3x - 32$		Equation of tangent formed.	
(c)	$h'(x) = \frac{2}{5}x - 2$ $h(x) = \frac{x^2}{5} - 2x + c$ Through $(5,6)$ $c = 11$ $h(x) = \frac{x^2}{5} - 2x + 11$	Equation of line found and anti-differentiated.	Equation of curve given OR equivalent.	
(d)	$f'(x) = 2Px + Q = 0$ $f'\left(\frac{2}{3}\right) = \frac{4P}{3} + Q = 0$ $9 = P + Q + 2$ $\Rightarrow Q = 7 - P$ $P = -21$ $Q = 28$ $f(x) = -21x^2 + 28x + 2$ $f(3) = -103$ Hence $(3,-103)$	Derivative found and equated to 0.	P or Q calculated.	P and Q found and coordinates calculated.
(e)	$L = 12x + 4h$ $h = \frac{L - 12x}{4}$ $v = \frac{Lx^2}{2} - 6x^3$ For max $\frac{dV}{dx} = 0$ $Lx - 18x^2 = 0$ $x = \frac{L}{18}$ Hence length is $2x = \frac{2L}{18} = \frac{L}{9}$	Attempted to find an equation in one variable and successfully differentiated.	Equation for volume found and differentiated and set equal to 0.	Found the value for x, ie $x = \frac{L}{18}$

NØ no response; no relevant evidence
N1 attempt at one question
N2 1 of u
A3 2 of u
A4 3 of u
M5 1 of r
M6 2 of r
E7 1 of t
E8 2 of t

Judgement Statement

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
Score range	0 – 7	8 – 14	15 – 19	20 – 24