MMA Trial Exam 2011

1a $\frac{1}{2\sqrt{x}} \sin(x) + \sqrt{x} \cos(x)$

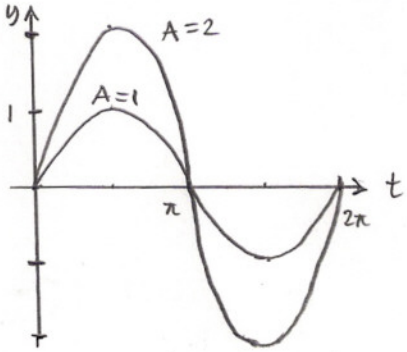
1b $f'(x) = 6x \cos(x^2+5)$

2a $-6 \sin(2x)$

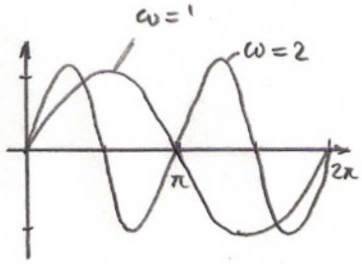
2b $x = 0$

2c $x = \frac{\pi}{2} p \quad , p \in \mathbb{Z}$

3a



3b



3c $y'(t) = A\omega \cos(\omega t)$

$y''(t) = -A\omega^2 \sin(\omega t)$

4a $\int_{-1}^{1} (3x^2+8x+1)\,dx = [x^3 + 4x^2 + x]_{-1}^{1} = 4$

4b $\int_{0}^{\pi/2} (\cos(x)+2)\,dx = [\sin(x) + 2x]_{0}^{\pi/2} = 1+\pi$

4c $\int_{1}^{3} \frac{1}{t}\,dt = [\ln(t)]_{1}^{3} = \ln(3)$

5a $\vec{PQ} = Q - P = (0,2,0)$

$\vec{PR} = R - P = (3,2,\sqrt{3})$

5b $(x,y,z) = (1,2,0) + t(0,2,0) \quad , t \in \mathbb{R}$

5c $\theta = \frac{\pi}{3}$

6a $\overrightarrow{PQ} = Q - P = (1, 0, -1)$
$\overrightarrow{PR} = R - P = (2, 3, 1)$

6b $\overrightarrow{PQ} \times \overrightarrow{PR} = 3\vec{i} - 3\vec{j} + 3\vec{k} = (3, -3, 3)$

6c $\text{area}(\Delta PQR) = \frac{3\sqrt{3}}{2}$

6d $3(x-7) + (-3)(y-2) + 3(z-3) = 0 \Leftrightarrow$

$x - y + z = 8$

7a $\vec{v}(t) = (\cos(t), -\sin(t), 1)$

$v(t) = |\vec{v}(t)| = \sqrt{2}$

7b $\vec{a}(t) = (-\sin(t), -\cos(t), 0)$

7c $\frac{\pi}{2}$

8a $\left[\begin{array}{ccc|c} 1 & 1 & -6 & 3 \\ 0 & 1 & 1 & 2 \\ 2 & 1 & -13 & 4 \end{array}\right]$

8b $\left[\begin{array}{ccc|c} 1 & 1 & -6 & 3 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{array}\right]$

8c $\left[\begin{array}{ccc|c} 1 & 0 & -7 & 1 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{array}\right]$

8d $x_1 = 1 + 7x_3$
$x_2 = 2 - x_3$
x_3 free

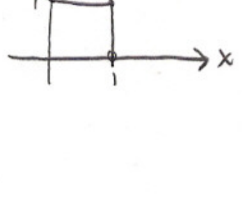
9a $AB = \begin{bmatrix} 2 & 8 \\ -1 & 5 \end{bmatrix}$

9b $BA = \begin{bmatrix} 8 & -2 \\ 13 & -1 \end{bmatrix}$

9c $A^T B^T = (BA)^T = \begin{bmatrix} 8 & 13 \\ -2 & -1 \end{bmatrix}$

9d C is invertible and $C^{-1} = \begin{bmatrix} 2 & -1 & -1 \\ 2 & -1 & -2 \\ -1 & 1 & 1 \end{bmatrix}.$

10a



10b