Assignment 1

The due date for submitting this assignment has passed.  

As per our records you have not submitted this assignment.  

1) Consider the functional  

$$J(y) = \int_x^1 (1 + x)y^2 \, dx$$

where $y$ is twice continuously differentiable and $y(0) = 0$ and $y(1) = 1$. Of all functions of the form

$$y(x) = x + c_1 x(1 - x) + c_2 x^2(1 - x)$$

Where $c_1$ and $c_2$ are constants, if we minimize $J$, Then which of the following option is / are correct?

- $y = \frac{186}{131} x - \frac{77}{131} x^2 - \frac{20}{131} x^3$  
- $y = \frac{186}{131} x - \frac{77}{131} x^2 + \frac{20}{131} x^3$  
- $y = \frac{186}{131} x + \frac{77}{131} x^2 - \frac{20}{131} x^3$  
- $y = \frac{186}{131} x + \frac{77}{131} x^2 + \frac{20}{131} x^3$  
- $y = \frac{146}{131} x - \frac{97}{131} x^2 - \frac{20}{131} x^3$  
- $y = \frac{146}{131} x - \frac{97}{131} x^2 + \frac{20}{131} x^3$  
- $y = \frac{146}{131} x + \frac{97}{131} x^2 - \frac{20}{131} x^3$  
- $y = \frac{146}{131} x + \frac{97}{131} x^2 + \frac{20}{131} x^3$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
- $y = \frac{186}{131} x - \frac{77}{131} x^2 - \frac{20}{131} x^3$

2) Let $f = x^2 + y^2 + z^2$ subject to  

$$\phi = xy + 1 - z = 0$$

Then Which of the following is / are correct options?

- Minimum of $f$ is 1  
- Minimum of $f$ is 2  
- Minimum of $f$ is 1 at $(1, 0, 0)$  
- Minimum of $f$ is 1 at $(0, 0, 1)$  
- Minimum of $f$ is 2 at $(0, 0, 1)$  
- Minimum of $f$ is 2 at $(0, 1, 0)$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
- Minimum of $f$ is 1  
- Minimum of $f$ is 1 at $(0, 0, 1)$

3) Of all paraboloids which pass through the points $(0, 0)$ and $(1, 1)$, determine that one which, when rotated about the $x$-axis, generates a solid of revolution with least possible volume between $x = 0$ and $x = 1$. Notice that the equation may be taken in the form $y = x + cx(1 - x)$, when $c$ is to be determined.

- minimum volume is $\frac{\pi}{2}$  
- minimum volume is $\frac{\pi}{4}$  
- minimum volume is $\frac{\pi}{8}$  
- minimum volume is $\frac{3\pi}{8}$  
- minimum volume is $\frac{\pi}{16}$  
- minimum volume is $\frac{5\pi}{16}$  
- minimum volume is $\frac{7\pi}{16}$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
- minimum volume is $\frac{\pi}{8}$