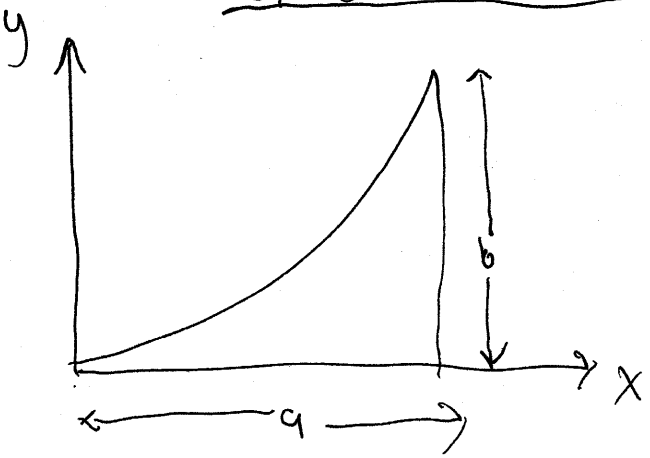
Spring 2016, WSU PhD Candidacy, Mathematics

(1)



Find centroid of parabola.

(2) $e^{-t}u_1(x) + e^{t}u_2(x) = y$ and $y'' - y = f(t)$

$e^{-t}u_1'(x) + e^{t}u_2'(x) = 0$ Find general form of $u_1(x)$ and $u_2(x)$

(3) $3\frac{\partial^2 u}{\partial x^2} + 5(u(x,t)) = \frac{\partial u}{\partial t}$ $0 < x < \pi$ Solve by seperation of variables

(4) Give $f(x,y,z) = x^2y - 2xy + e^{2z}$

Find directional derivative in $(-4\hat{i} + 4\hat{j} + 2\hat{k})$ direction at point $(1,1,0)$

Find the $div(\nabla f)$ at $(2,1,0)$

(5) $y''' - y' = 5 - 4\cos(x) + 2e^x$

Solve ODE

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(6) $f(x) = x$ Find cosine series of function in general form of A_0 and A_n.

State the 4th non-zero term.

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(7)

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 4 & 1 \end{bmatrix}$$

Find all eigenvalues

Find eigenvector of largest eigenvalue.

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(8) $\dot{x} = -5x - y \qquad x(1) = 0$

$\dot{y} = -y + 4x \qquad y(1) = 1$

Solve

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(9) $y'(t) = 1 - \sin(t) - \int_0^t y(\tau)\, d\tau \quad ; \quad y(0) = 0$

Solve integro-differential eq with Laplace transforms