Math for Architects MTH 111 Summer 2012, 1–7

MTH 111, Math for the Architects, Final Exam

Ayman Badawi

QUESTION 1. (16 points) Find y' = dy/dx do not simplify

(i) $y = 2Sec(4x + 3) + (1 + cos(5x + 1))^4$

(ii)
$$y = [ln(3x+1)][e^{(3x+1)}]$$

(iii)
$$y = ln\left(\frac{(x^3+x+1)^3}{(e^x+4x-5)^2}\right)$$

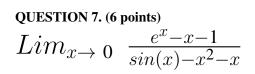
$$(iv) y = e^{(tan(4x)+3x-1)} + ln(4x^2 + x - 1) + 2x - 11$$

QUESTION 2. (6 points) Find the equation of the tangent line to the curve $(x+1)sin(y-4)+ye^x+cos(x)+2y-13=0$ at the point (0,4)

QUESTION 3. (10 points) Sketch the graph of f(x) = cos(x) + sin(x) + 3 defined on $[-\pi, \pi]$ by considering the first derivative and the second derivative of f(x). [Between 0 and π note that cos(x) = sin(x) when $x = \pi/4$ and sin(x) = -cos(x) when $x = 3\pi/4$]

QUESTION 5. (4 points) Rotate the graph $y = \sqrt{4 - x^2}$ (note that the graph is a semi-circle) around the x-axis where x is between x = -2 and x = 2. Find the volume of the object you generated.

QUESTION 6. (6 points) Find the area of the region bounded by $y = x^3 + 2x^2 - 3x$, x-axis, x = 0, and x = 2.



(ii)
$$Lim_{x \to 1} \frac{\sqrt{x-x}}{e^{(x-1)}-1}$$

QUESTION 8. (8 points) Given the ellipse $x^2 + 4y^2 - 4x + 4y^2 = 0$. Find the center, the foci, and the constant k. Sketch a rough graph of the given ellipse.

QUESTION 9. (8 points) Given (-4, 3) is the vertex of a parabola that has the directrix x = 1. Find the standard equation of the parabola and find its focus, say *F*. Let *Q* be a point on the parabola. Find |QF|. Sketch a rough graph of the given parabola.

QUESTION 10. (5 points) given $f'(x) = 2x + cos(x) + e^x$ and f(0) = 4. Find the function f(x).

QUESTION 11. (6 points) Given $Q = (2, \frac{14}{3})$ lies on the graph of $f(x) = \frac{1}{3}x^3 + ax^2 + bx + c$ such that f'(2) = 0 but Q is neither a local minimum point nor a local maximum point. Find the values of the constants a, b, c.

QUESTION 12. (5 points) Find a point, say Q, on the graph $y = \sqrt{x}$ that is the nearest to the point (4.5,0)

QUESTION 13. (12 points)

(i)
$$\int \frac{1}{x+\sqrt{x}} dx$$
 [Hint: you may want to factor $x+\sqrt{x}$ some how!!!]

(ii)
$$\int e^{2x} (3 + e^{2x})^7 dx$$

(iii)
$$\int \frac{\sin(x)+1}{\cos^2(x)} dx$$

Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates. E-mail: abadawi@aus.edu, www.ayman-badawi.com