

MTH 111, Math for Architects, Exam III, Summer 2013

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QUESTION 1. Let $f(x) = 2xe^{(3x-2)} - 2e^{(3x-2)} + \frac{8}{3}$.

i) For what values of x does $f(x)$ increase?

ii) For what values of x does $f(x)$ decrease?

iii) Find all local minimum (maximum) values of $f(x)$.

QUESTION 2. Given two points $A = (8, 5), B = (4, 7)$. Find a point on the horizontal line $x = 1$, say C, such that $|AC| + |CB|$ is minimum.

QUESTION 3. Given $4e^{y-2} + xy + x^2 + 4y + 2x + 2y^2 - 25 = 0$. Find an equation of the tangent line to the curve at the point $(1, 2)$.

QUESTION 4. A particle moves on the curve $x^2 + 2y^2 + 4e^{2y-2} + 8x - 26 = 0$, such that the rate of change of x is decreasing by 0.3 cm/sec. Find the rate of change of y at the point $(2, 1)$.

QUESTION 5. Let $f(x) = -2x^3 + 12x^2 + 2$. Sketch $f(x)$ but first determine when $f(x)$ is increasing (decreasing), local min.(max) values of $f(x)$, when the curve is concave up (down), and inflection point.

QUESTION 6. What is the length and the width of the largest rectangle that you can construct where one vertex lies on the line $y = -x + 32$, one vertex lies on the line $y = x - 32$, and two vertices lie on the y-axis?

QUESTION 7. Given $x^2 + yx + 4y^2 - 16 = 0$

i) Find all points on where tangent lines are horizontal.

ii) Find the equation of the tangent line to the curve at $(3, 1)$.

QUESTION 8. What is the length and the width of the largest rectangle that you can construct where two vertices lie on $y = 8 - x^2$ and two vertices lie on $y = x^2 - 8$.

QUESTION 9. Find two numbers a, b such that $a + 4b = 34$ and ab is maximum.

QUESTION 10. Find y' and do not simplify:

a) $y = 5\sqrt{3x^2 + 6x + 1}$

b) $y = 4x^3 + \frac{6}{x^2} + 10x + 5$

c) $y = (3x + 2)(x^3 + 6x + 3)^3$

d) $y = ln(x + 3)(e^{3x+1} + 7x - 2)^3$

e) $y = ln[(x^3 + 7x - 1)^4(3x^3 + 2x)^6]$

QUESTION 11. Let $y = 12\sqrt{x + 1} + 2x - 4$. Find an equation of the tangent line to the curve at the point $(3, 26)$.

QUESTION 12. Let $k(x) = 2x^3 + 3x^2 - 12x + 20$ defined on $[-3, 2]$. Find the absolute maximum (absolute minimum) value of $k(x)$.

QUESTION 13. a) $lim_{x\to\ 2}\ \frac{\sqrt{x+2}-x}{x-2}$

b) $lim_{x\to\ -3^-}\ \frac{x+4}{x+3}$

c) $lim_{x\to\ -1}\ \frac{x^2-1}{x^2+7x+6}$

d) $lim_{x\to\ 4}\ \frac{\sqrt{x}+e^{x-4}-3}{x^2+ln(x-3)-16}$

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