

MTH 111, Math for Architects, Exam II, Spring 2014

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QUESTION 1. (i) Let $f(x) = -x^2 + 8x - 1$. The slope of the tangent line to the curve at the point $(1, 6)$

~~a.~~ 6

b. -2

c. 5

(ii) Let $f(x) = -x^3 + 12x + 1$. Then $f(x)$ increases on the interval

a. $x \in (-\infty, -2) \cup (2, \infty)$

~~b.~~ $x \in (-2, 2)$

c. $x \in (-\sqrt{12}, \sqrt{12})$

d. none of the above

(iii) let $f(x) = 3e^{(x^2-2x)} + 4$. Then $f'(2)$

~~a.~~ 6

b. 3

c. 2

d. none of the above

(iv) Let $f(x) = xe^{(x-2)} + e^{(x-2)} + 3$. Then

~~a.~~ $f(x)$ has a local minimum at $x = -2$

b. $f(x)$ has a local maximum at $x = 2$

c. $f(x)$ has a local minimum at $x = -1$

d. $f(x)$ has a local maximum at $x = -1$

e. none of the above

(v) Let $f(x) = -x(x - 18)^5$. Then

~~a.~~ $f(x)$ has a local maximum at $x = 3$

b. $f(x)$ has a local minimum at $x = 18$

c. $f(x)$ has a local maximum at $x = 18$

d. $f(x)$ has a critical value when $x = -18$

e. none of the above

(vi) Given $x^2 + y^2 - xy = 0$. Then $dy/dx =$

a. $\frac{2y-x}{y-2x}$

b. $\frac{y-2x}{x-2y}$

c. $\frac{2x-y}{2y-x}$

~~d.~~ $\frac{y-2x}{2y-x}$

(vii) Given $f(x) = \sqrt{4x-3} + \frac{1}{x} + 2$. Then $f'(1) =$

a. 4

b. 2

~~c.~~ 1

d. 3

(viii) Given the curve of $f'(x)$. Then

a. $f(x)$ is decreasing on the the interval $(1, 2)$

b. $f(x)$ is decreasing on the interval $(-\infty, 0)$

~~c.~~ $f(x)$ is increasing on the interval $(-\infty, 2)$

d. $f(x)$ is decreasing on the interval $(-\infty, 0)$

e. above, there are more than one correct answer.

(ix) Using the curve of $f'(x)$ above. Then

a. $f(x)$ has a local min. value at $x = 0$ but no local max. values.

b. $f(x)$ has neither local min. values nor local max. values

~~c.~~ $f(x)$ has a local max. value at $x = 2$

d. $f(x)$ has a local min. value at $x = 0$ and a local max. value at $x = 1$.

~~(x) Using the curve of $f'(x)$ above. Then~~

~~a. the curve of $f(x)$ must be concave down on the interval $(0, 1)$.~~

~~b. the curve of $f(x)$ must be concave up on the interval $(2, \infty)$~~

~~c. the curve of $f(x)$ must be concave down on the interval $(-\infty, -1)$~~

~~d. above, there are more than one correct answer.~~

(xi) Given $f'(3) = f'(-1) = f'(6) = 0$, $f^{(2)}(2) = 4$, $f^{(2)}(-1) = -5$, and $f^{(2)}(6) = 0$ (note that $f^{(2)}$ means the second derivative of $f(x)$). Then

a. $f(x)$ has neither local min. value nor local max. value at $x = 6$.

b. $f(x)$ has a local max. value at $x = 3$

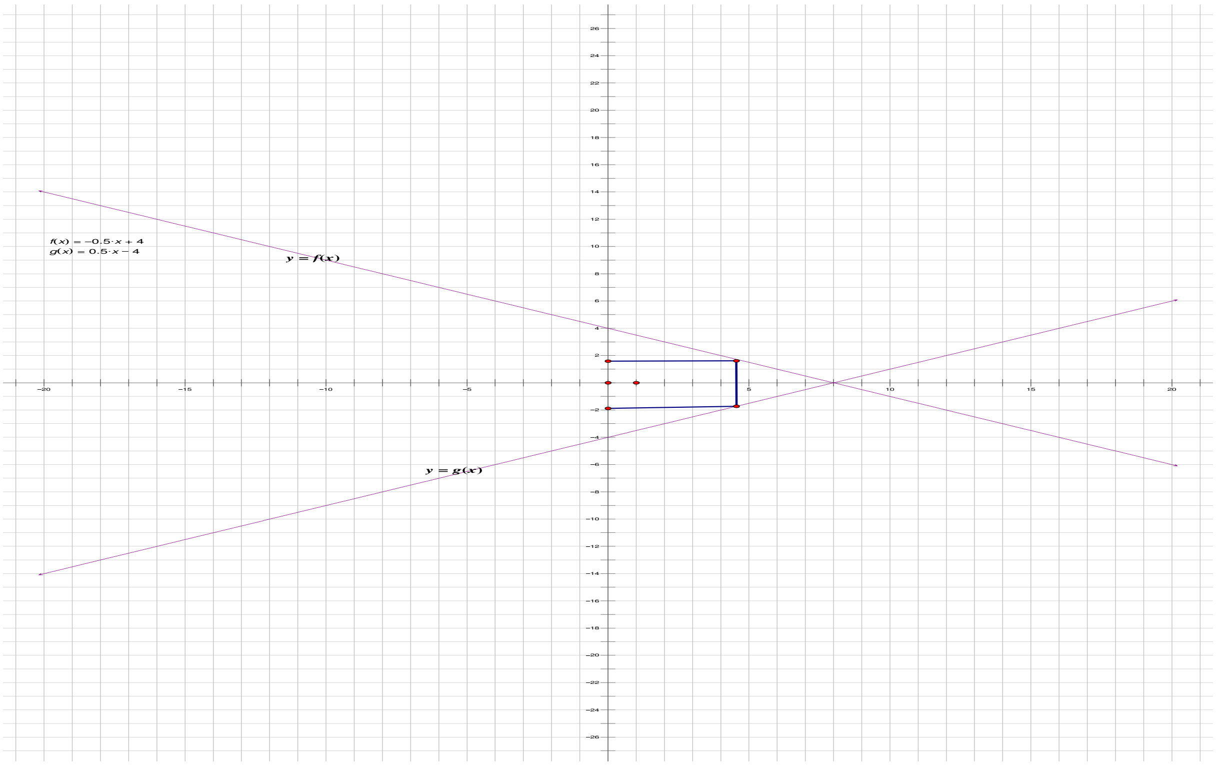
~~c.~~ $f(x)$ has a local max. value at $x = -1$.

d. None of the above

(xii) Given x, y are two positive real numbers such that $x + 2y = 26$ and xy is maximum. Then $xy =$

- a. 52
- ~~b.~~ 84.5
- c. 78
- d. 169
- e. none of the above

(xiii) What is the area of the largest rectangle that can be drawn as in the figure below (note $f(x) = -0.5x + 4$ and $g(x) = 0.5x - 4$)?



- ~~a.~~ 16
- b. 32
- c. 64
- d. none of the above

(xiv) Given the points $A = (2, 4)$ and $B = (0, 6)$. What is the point c on the $x-axis$ so that $|AC|+|CB|$ is minimum?

- a. (2, 0)
- ~~b.~~ (1.2, 0)
- c. (1.5, 0)
- d. (1, 0)
- e. None of the above

~~(xv) A particle moves on the curve $4x^2 + 6y^2 = 22$. If the x-coordinates increases at rate 0.3/second, what is the rate of change of y when the particle reaches (2, 1)?~~

- ~~a. 0.4~~
- ~~b. -0.4~~
- ~~c. -0.3~~
- ~~d. none of the above~~

(xvi) Given $f(x) = (4x - 7)^{11}$, $f'(2)$ =

- a. 11
- ~~b.~~ 44
- c. 4
- d. non of the above

(xvii) Given $f(x) = ln[\frac{5x-14}{3x-8}]$. Then $f'(3)$

a. 2
b. $\frac{5}{3}$
c. 15
d. None of the above

(xviii) Given $(-4, 2), (0, 0), (6, 8)$ are vertices of a triangle. The area of the triangle is

a. 44
b. 22
c. $\sqrt{44}$
d. $\sqrt{22}$
e. None of the above.

(xix) $lim_{x \to 2} \ \frac{e^{(3x-6)}+x-3}{x^3-x^2-4} =$

a. 0.5
b. 0
c. 0.25
d. none of the above

(xx) $lim_{x \to 3} \ \frac{x^2-18}{(x-3)^2} =$

a. 0
b. $-\infty$
c. ∞
d. DNE (does not exist)
e. -9

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