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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.

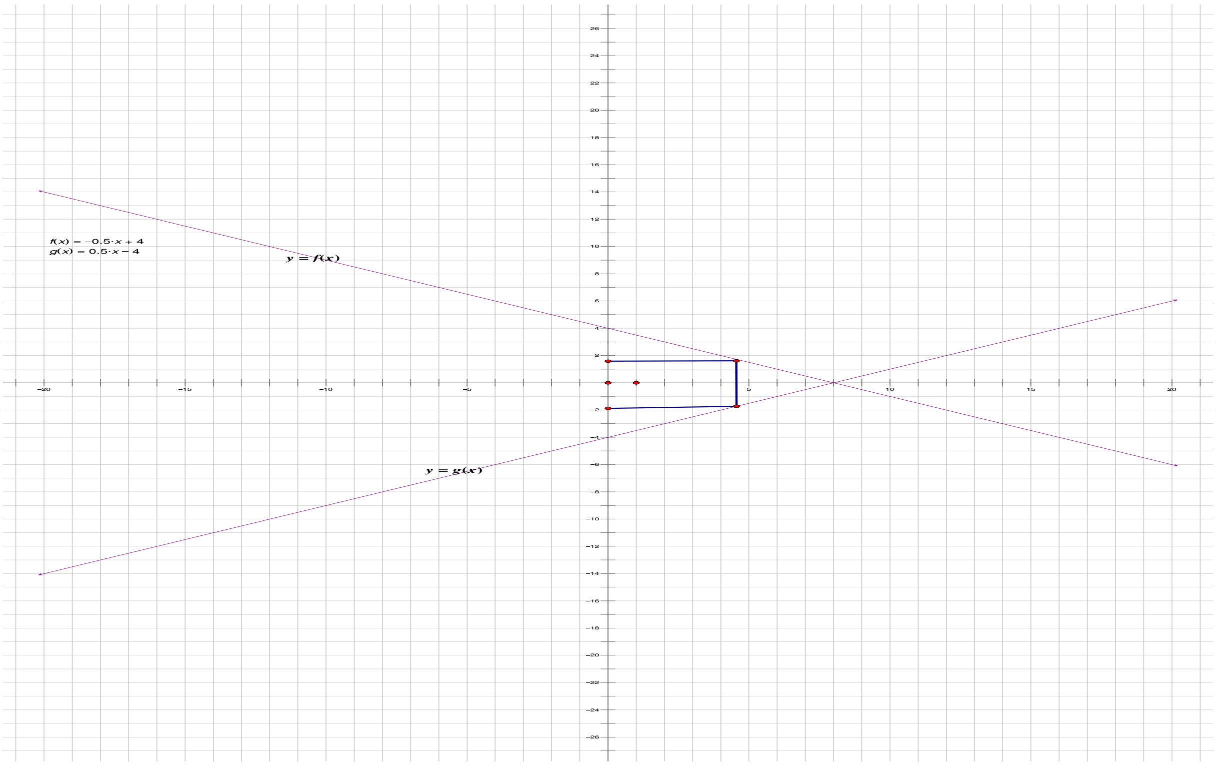
(xi) Given $f'(3) = f'(-1) = f'(6) = 0$, $f^{(2)}(2) = 4$, $f^{(2)}(-1) = -5$, and $f^{(2)}(6) = 0$ (note that $f^{(2)}$ means the second derivative of $f(x)$). Then

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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