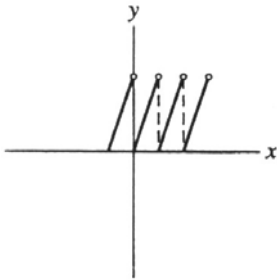


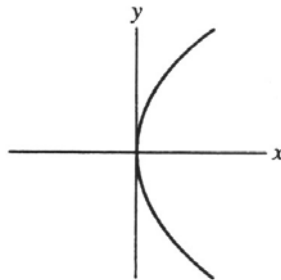
Problem 1**1 Point**

Decide which of the curves below are graphs of functions?

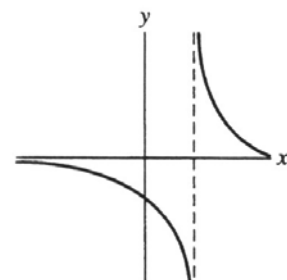
(I)



(II)



(III)



- a) (I) and (III) only;
- b) (I) and (II) only;
- c) (I) only;
- d) none of the above.

Problem 2**1 Point**If $f(x) = \sqrt{1 + \sqrt{x}}$, find $f(9)$.

- a) $\sqrt{3}$
- b) $\sqrt{10}$
- c) 3
- d) 2

Problem 3

1 Point

If money earns interest at an annual rate of 8% compounded continuously, then the value (in dollars) of \$10,000 due at the end of five years is

- a) $10000(1.08)^{-5}$;
- b) $10000(1.08)^5$;
- c) $10000e^{0.4}$;
- d) $10000e^{-0.4}$.

Problem 4

2 Points

A set of exam scores is 80, 75, 85, 90, 100, 70, 60 . The standard deviation equals to

- a) $\sqrt{150}$
- b) $\sqrt{50}$
- c) $\sqrt{20}$
- d) 80

Problem 5**2 Points**

A gumball machine has six red gumballs, four blue gumballs and three yellow gumballs. If you buy three gumballs, what is the probability that you get three different colors?

a) $\frac{1}{72}$

b) $\frac{1}{24}$

c) $\frac{3}{13}$

d) $\frac{36}{143}$

Problem 6**2 Points**

If $f(x) = \frac{x^2 + 1}{e^{3x}}$, then $f'(x) =$

a) $\frac{2x - x^2 - 1}{e^{6x}}$

b) $\frac{2x - x^2 - 1}{e^{3x}}$

c) $\frac{2x - 3x^2 - 3}{e^{3x}}$

d) $\frac{2x - 3x^2 - 3}{e^{6x}}$

Problem 7**2 Points**

Let $f(x) = \frac{1}{x+1}$, and $g(x) = \frac{1}{x+2}$, $x \neq -1; -2$. Calculate $g(f(x))$.

a)

$$\frac{x}{3x+2}, x \neq -1; -\frac{2}{3}$$

b) $\frac{x+1}{3x+2}, x \neq -1; -\frac{2}{3}$

c) $\frac{x+1}{2x+3}, x \neq -1; -\frac{3}{2}$

d) $\frac{x+1}{x+2}, x \neq -1; -2$

Problem 8**1 Point**

Find the slope of the graph of $y = \sqrt{2x^2 + 1}$ at the point $(2; 3)$.

a) 12

b) $\frac{4}{3}$

c) $\frac{1}{4}$

d) $\frac{3}{2}$

Problem 9**2 Points**

What is the range of the function $f(x) = x^4 + 1$ over the domain $-2 < x < 3$?

- a) (17; 82) b) (1; 17) c) [1; 82) d) [17; 82]

Problem 10**2 Points**

Find the points where the tangent lines of the graph $f(x) = \frac{4x^2}{x+2}$ are horizontal lines.

- a) $x = -2$; b) $x = 0; -2$; c) $x = -4; -2; 0$; d) $x = 0; -4$.

Problem 11**2 Points**

If $f(x) = \begin{cases} x+1, & \text{if } x \geq 1 \\ x-1, & \text{if } x < 1 \end{cases}$, then $\lim_{x \rightarrow 1} f(x) =$

a) $-\infty$

b) 2

c) 0

d) does not exist

Problem 12**Point 1**

An equation of the tangent line to the curve $y = 4x^2 - 6x - 5$ at the point $(-1; 5)$ is

a) $y = (8x - 6)(x - 1) + 5;$

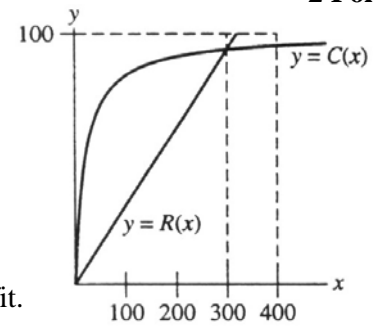
b) $y = -14x - 9;$

c) $y = -14x + 19;$

d) $y = 8x - 6.$

Problem 13**2 Points**

Consider the cost and revenue functions shown here, where the cost of producing x items is $C(x)$ dollars and the revenue from the sale of x items is $R(x)$ dollars (See figure).



Which of the following statements is/are true?

- (I) More than 300 items must be sold in order to make a profit.
- (II) No profit is made if fewer than 300 items are sold.
- (III) It is better to produce even a very few items than to produce none at all.
- (IV) The cost to produce 100 items is \$400.

- a) (I) and (II);
- b) (III) only;
- c) (II) and (IV);
- d) (II) and (III).

Problem 14**2 Points**

A manufacturer of automobiles conducted a market survey. Eighty percent of the customers want better fuel efficiency, while 55% want a vehicle navigation system and 45% percent want both features.

The probability that a person wants either better fuel efficiency or a vehicle navigation system is:

- a) 0.35
- b) 0.9
- c) 0.40
- d) 0.1

Problem 15**2 Points**

Each question on a four-question multiple-choice examination has three choices, only one of which is correct. By answering each question in a random fashion, the probability that exactly two questions are answered correctly is

a) $\frac{1}{2}$

b) $\frac{11}{27}$

c) $\frac{8}{27}$

d) $\frac{1}{6}$

Problem 16**3 Points**

Which of the following properties are satisfied by the function $f(x) = \begin{cases} x^2 + 1, & \text{for } x < 0 \\ 1, & \text{for } x = 0 \\ 5x + 1, & \text{for } x > 0 \end{cases}$?

- (I) $f(x)$ is continuous
- (II) $f(x)$ is differentiable for all x
- (III) $f(x)$ is differentiable at $x = -2$

a) I only

b) I, II, and III

c) III only

d) I and III only

Problem 17**3 Points**

On the interval $[-1; 1]$, the function $y = 4 + x^2 - x^3$ has an absolute maximum when $x =$

- a) -1 ;
- b) 1 ;
- c) $\frac{2}{3}$;
- d) 0 .

Problem 18**3 Points**

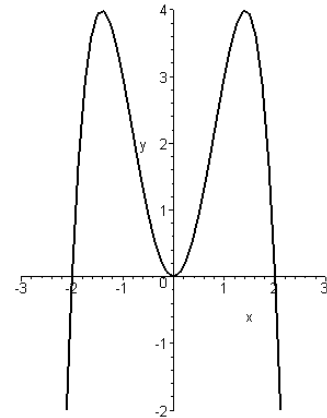
Let $f(x) = x^3$. Using the chain rule, determine an expression for the derivative of $f(g(x))$.

- a) $[g'(x)]^3$;
- b) $3[g(x)]^2 \cdot g'(x)$;
- c) $3[g(x)]^2$;
- d) $3x^2 \cdot g'(x)$.

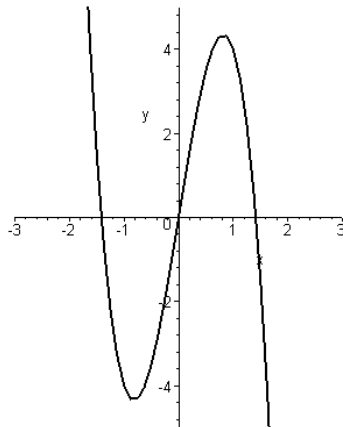
Problem 19

3 Points

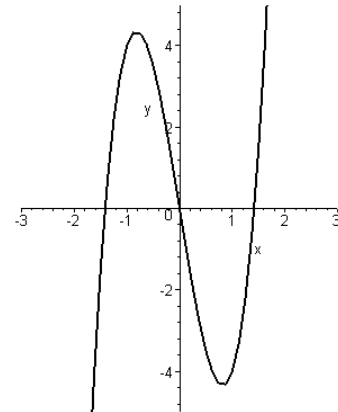
The graph of a function $y = f(x)$ is given. Which of the following could be the graph of $y = f'(x)$?



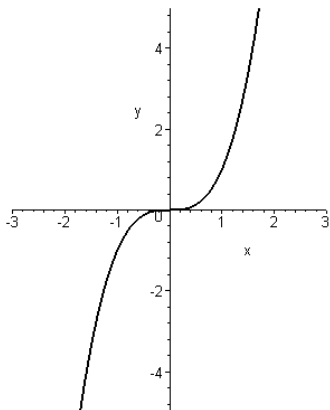
a)



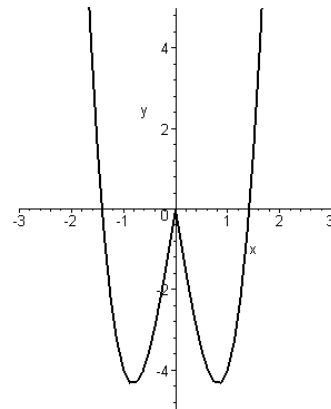
b)



c)



d)



Problem 20**3 Points**

If $f(x) = x^3 + 3x^2 - 24x + 8$, then f is

- a) decreasing on $(1; 2)$ and has a relative minimum when $x = -4$;
- b) decreasing on $(-4; 2)$ and has a relative maximum when $x = -4$;
- c) increasing on $(-4; 2)$ and has a relative maximum when $x = 2$;
- d) decreasing on $(2; \infty)$ and has a relative minimum when $x = 2$.

Answer Keys

- | | |
|----|---|
| 1 | a |
| 2 | d |
| 3 | c |
| 4 | a |
| 5 | d |
| 6 | c |
| 7 | c |
| 8 | b |
| 9 | c |
| 10 | d |
| 11 | d |
| 12 | b |
| 13 | a |
| 14 | b |
| 15 | c |
| 16 | d |
| 17 | a |
| 18 | b |
| 19 | a |
| 20 | b |