

1) Solve this equation:  $\left(\frac{1}{4}\right)^{3x} = 64^{2x-1}$

A.  $x = 3$

B.  $x = \frac{1}{3}$

C.  $x = -\frac{1}{3}$

D.  $x = -3$

E.  $x$  cannot be determined

2) Find the derivative of the function  $f$ , where  $f(x) = x^4 e^x$ .

A.  $f'(x) = x^3(e^x)(x+4)$

B.  $f'(x) = 4x^3(e^x)$

C.  $f'(x) = 4x^3(e^x)^2$

D.  $f'(x) = x^3(e^x)^2(x+4)$

E. None of the above.

3) Find the derivative of  $y = (x^2 + \ln x)^5$ .

A.  $y' = 5(x^2 + \ln x)\left(2x + \frac{1}{x}\right)$

B.  $y' = 5\left(2x + \frac{1}{x}\right)^4$

C.  $y' = 5(x^2 + \ln x)^4\left(2x + \frac{1}{x}\right)$

D.  $y' = 5(x^2 + \ln x)^4$

E.  $y' = 5\left(x + \frac{1}{x}\right)^4\left(2x + \frac{1}{x}\right)$

- 4) Use the table of values of the functions  $f$  and  $g$  and their derivatives at various values. Find the value of  $D_x(f[g(x)])$  at  $x = 2$ .

$x$	1	2	3	4
$f(x)$	3	4	2	1
$f'(x)$	-5	-6	-7	-11
$g(x)$	4	1	2	3
$g'(x)$	$\frac{2}{9}$	$\frac{3}{10}$	$\frac{4}{11}$	$\frac{5}{12}$

- A.  $\frac{5}{12}$   
 B.  $-\frac{9}{5}$   
 C. -6  
 D. -5  
 E. Does not exist.

- 5) Suppose \$26,000 is invested for 4 years at 6% interest. Find the amount of **interest** earned over this period if the interest is compounded quarterly. Round your answer to the nearest cent.

- A. \$6993.62  
 B. \$6824.40  
 C. \$6936.02  
 D. \$7052.48  
 E. None of the above.

- 6) Which of the following statements is(are) true?

I	$7^x = 10$ is equivalent to $\log 7 = x$
II	$\log_3\left(\frac{1}{27}\right) = -3$
III	$\ln\left(\frac{1}{e}\right) = -1$

- A. I and II only  
 B. II and III only  
 C. III only  
 D. I, II, and III  
 E. II only

- 7) Solve this equation. Which statement describes the solution?

$$\log_3 x - \log_3 3 = 2$$

- A. The solution is less than 4.
- B. The solution is at least 4, but less than 8.
- C. The solution is at least 20.
- D. The solution is at least 12, but less than 20.
- E. The solution is at least 8, but less than 12.

- 8) Use the properties (rules) of logarithms to help find the derivative to this function  $f$ . Simplify.

$$f(x) = \ln[x(x^2 + 1)^2]$$

- A.  $f'(x) = \frac{5x^2 + 1}{x(x^2 + 1)}$
- B.  $f'(x) = \frac{4x}{x(x^2 + 1)}$
- C.  $f'(x) = \frac{(x+1)^2}{x(x^2 + 1)}$
- D.  $f'(x) = \frac{3x^2 + 1}{x(x^2 + 1)}$
- E.  $f'(x) = \frac{x^2 + 3}{x(x^2 + 1)}$

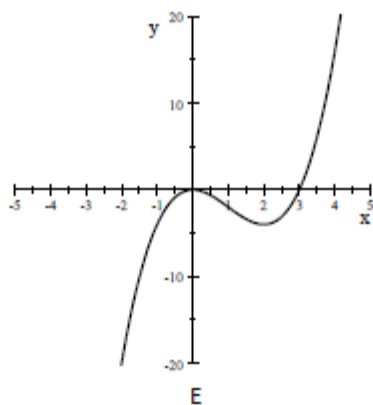
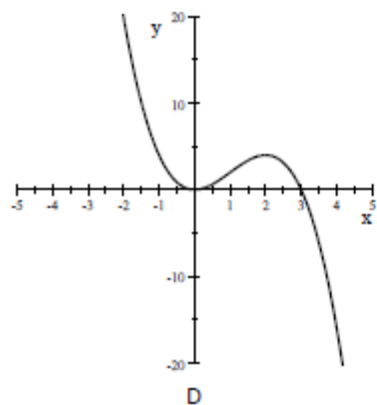
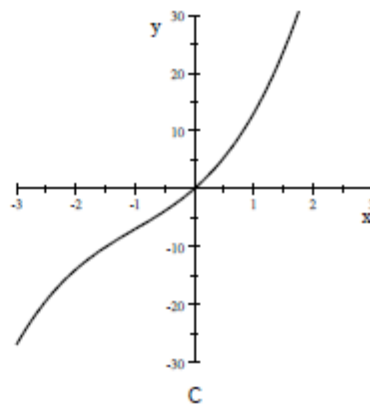
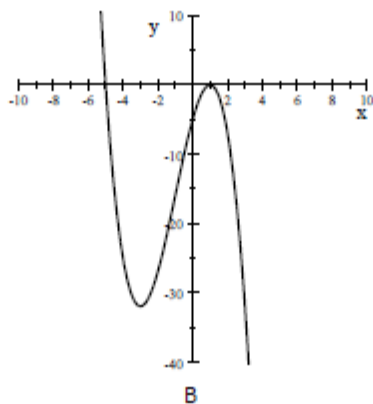
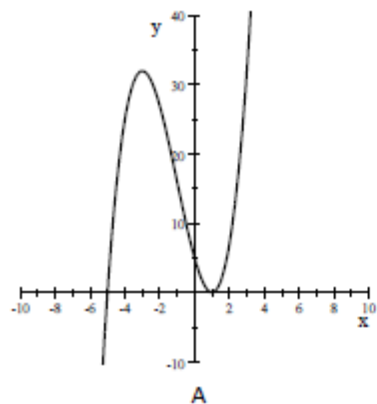
- 9) Which choice is one of the intervals where the function  $f$  below is decreasing?

$$f(x) = \frac{1}{4}x^4 - 2x^2$$

- A.  $(-2, 0)$
- B.  $(2, \infty)$
- C.  $(-2, \infty)$
- D.  $(-2, 2)$
- E.  $(0, 2)$

- 10) Given the function  $f(x) = x^4 - x^3$  Which of the following statements is **false**?
- A.  $f$  is decreasing on the interval  $(-\infty, 0)$ .
  - B.  $f$  is decreasing on the interval  $\left(\frac{3}{4}, \infty\right)$ .
  - C.  $f$  has a relative minimum when  $x = \frac{3}{4}$ .
  - D.  $f$  is concave upward on the interval  $(-\infty, 0)$ .
  - E.  $f$  is concave downward on the interval  $\left(0, \frac{1}{2}\right)$ .
- 11) The profit for a fast-food restaurant can be modeled by the function  $P(x) = 2.44x - \frac{1}{20000}x^2 - 5000$ ,  $0 \leq x \leq 50,000$ , where  $x$  is the number of hamburgers made and sold. What is the **maximum profit**? (Round to the nearest dollar.)
- A. \$24,768
  - B. \$85,400
  - C. \$24,400
  - D. \$82,360
  - E. \$24,687
- 12) What is the equation for a vertical asymptote for the graph of the function  $f(x) = \frac{2x^2 - 6}{x^2 - 2x + 1}$ ?
- A.  $x = -1$
  - B.  $x = 2$
  - C.  $x = \frac{1}{2}$
  - D.  $x = 1$
  - E.  $x = -2$

- 13) Which is the graph of the function  $f(x) = x^3 + 3x^2 - 9x + 5$ ? Use the information you find about intercepts, intervals of increasing or decreasing, intervals of concavity, and locations of any relative extrema.



- 14) Find the inflection point (point of inflection) for the graph of the function  $f(x) = -x(x-3)^2$ .

- A.  $(-2, 50)$
- B.  $(2, 0)$
- C.  $(2, 3)$
- D.  $(2, -2)$
- E.  $(-2, 0)$

15) Given the function  $g(x) = x(x-4)^3$ , which choice is false?

- A. The intercepts are (0,0) and (4,0).
- B. The function is increasing on  $(1,4) \cup (4,\infty)$ .
- C. The function is concave upwards on  $(-\infty,2) \cup (4,\infty)$ .
- D. There is an inflection point at (2,-16)
- E. There is a relative maximum value for this function.

16) Find the second derivative of the function below.

$$y = e^{x^2}$$

- A.  $2e^{x^2}(x+1)$
- B.  $2e^{x^2}(2x+1)$
- C.  $e^{x^2}(x^2+1)$
- D.  $2e^{x^2}(2x^2+1)$
- E.  $e^{x^2}(2x^2+1)$

17) Given that  $\log_b 2 = a$  and  $\log_b 3 = c$ , represent the value of  $\log_b 18$ .

- A.  $2(a+c)$
- B.  $2a+c$
- C.  $a+2c$
- D.  $2ac$
- E.  $a+c^2$