MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the graph to evaluate the indicated limit and function value or state that it does not exist.

1) Find \( \lim_{{x \to 0^-}} f(x) \) and \( \lim_{{x \to 0^+}} f(x) \). 

\[
\begin{array}{c|c|c|c|c|c|c|c|c|c|c|c|c}
& & & & & & & & & & & \\
7 & y & 6 & 5 & 4 & 3 & 2 & 1 & -1 & -2 & -3 & -4 & -5 & -6 & -7 \\
-7 & -6 & -5 & -4 & -3 & -2 & -1 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & x \\
\end{array}
\]

A) 3; Does not exist  
B) -1; 3  
C) Does not exist; does not exist  
D) 3; -1

Find the limit, if it exists.

2) Find: \( \lim_{{x \to -1}} \frac{6x+5}{5x-6} \).

\[
\begin{array}{c|c|c|c|c|c|c|c|c|c|c|c|c}
& & & & & & & & & & & \\
& 1 & 5 & 10 & 15 & 20 & 25 & 30 & 40 & 50 & 60 & 70 & \\
& -1 & -2 & -3 & -4 & -5 & -6 & -7 & -8 & -9 & -10 & -11 & -12 & \\
\end{array}
\]

A) 1  
B) -11  
C) \(-\frac{1}{11}\)  
D) \(\frac{1}{11}\)

The graph of \( y = f(x) \) is shown. Use the graph to answer the question.

3) Is \( f \) continuous at \( x = 0 \)?

\[
\begin{array}{c|c|c|c|c|c|c|c|c|c|c|c|c}
& & & & & & & & & & & \\
& 1 & 5 & 10 & 15 & 20 & 25 & 30 & 40 & 50 & 60 & 70 & \\
& -1 & -2 & -3 & -4 & -5 & -6 & -7 & -8 & -9 & -10 & -11 & -12 & \\
\end{array}
\]

A) No  
B) Yes

Provide an appropriate response.

4) Find the vertical asymptote(s) of the graph of the given function.

\( f(x) = \frac{3x-9}{5x+30} \)

A) \( x = -8 \)  
B) \( y = -3 \)  
C) \( y = 8 \)  
D) \( x = -6 \)

5) Find the slope of the secant line joining (2, \( f(2) \)) and (3, \( f(3) \)) for \( f(x) = -3x^2 - 8 \).

A) -55  
B) -15  
C) 55  
D) 15
Use the definition \( f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \) to find the derivative at \( x \).

6) \( f(x) = 4x + 4x^3 \)
   A) \( 4x + 12x^2 \)  
   B) \( 4x + 12x^3 \)  
   C) \( 4 + 4x^2 \)  
   D) \( 4 + 12x^2 \)  

List the \( x \)-values in the graph at which the function is not differentiable.

7)  
   A) \( x = -2, x = 2 \)  
   B) \( x = -3, x = 3 \)  
   C) \( x = -2, x = 0, x = 2 \)  
   D) \( x = -3, x = 0, x = 3 \)

Provide an appropriate response.

8) Find \( f'(x) \) for \( f(x) = 2x^5 + 6x^8 \).
   A) \( 2x^4 + 6x^7 \)  
   B) \( 10x^6 + 48x^9 \)  
   C) \( 10x^4 + 48x^7 \)  
   D) \( 10x^3 + 48x^2 \)

9) Find \( f'(x) \) if \( f(x) = 3x^4 + 6x^7 \).
   A) \( 12x^3 + 42x^6 \)  
   B) \( 7x^3 + 13x^6 \)  
   C) \( 3x^5 + 7x^8 \)  
   D) \( 4x^3 + 7x^6 \)

10) Find: \( \frac{dy}{dt} \) if \( y = 3t^{-4} - 5t^{-1} \)
    A) \( -12t^{-5} + 5t^{-2} \)  
    B) \( -12 \left( 5 - 5t^2 \right) \)  
    C) \( -12t^{-5} - 5t^{-2} \)  
    D) \( -\frac{12}{5} - \frac{5}{2} \)

11) A pen manufacturer determined that the total cost in dollars of producing \( x \) dozen pens in one day is given by:
    
    \( C(x) = 350 + 2x - 0.01x^2 \), \( 0 \leq x \leq 100 \)

    Find the marginal cost at a production level of 70 dozen pens and interpret the result.
    
    A) The marginal cost is \$0.58/doz. The cost of producing 1 dozen more pens at a production level of 70 dozen pens is approximately \$0.58.
    
    B) The marginal cost is \$0.60/doz. The cost of producing 1 dozen more pens at a production level of 70 dozen pens is approximately \$0.60.
    
    C) The marginal cost is \$0.59/doz. The cost of producing 1 dozen more pens at a production level of 70 dozen pens is approximately \$0.59.
    
    D) The marginal cost is \$0.62/doz. The cost of producing 1 dozen more pens at a production level of 70 dozen pens is approximately \$0.62.

Find \( dy \).

12) \( y = x \sqrt{7x + 3} \)
    A) \( \frac{21x + 6}{\sqrt{7x + 3}} \) \( dx \)  
    B) \( \frac{21x + 6}{2 \sqrt{7x + 3}} \) \( dx \)  
    C) \( \frac{21x - 6}{2 \sqrt{7x + 3}} \) \( dx \)  
    D) \( \frac{21x - 6}{\sqrt{7x + 3}} \) \( dx \)
Provide an appropriate response.

13) Suppose that the total profit in hundreds of dollars from selling $x$ items is given by $P(x) = 4x^2 - 5x + 10$. Find the marginal profit at $x = 5$.

A) $45$ 
B) $15$ 
C) $32$ 
D) $35$

14) A company is planning to manufacture a new blender. After conducting extensive market surveys, the research department estimates a weekly demand of 600 blenders at a price of $50$ per blender and a weekly demand of 800 blenders at a price of $40$ per blender. Assuming the demand equation is linear, use the research department’s estimates to find the revenue equation in terms of the demand $x$.

A) $R(x) = 20x + \frac{x^2}{20}$ 
B) $R(x) = 80x - 20$ 
C) $R(x) = 80x - \frac{x^2}{20}$ 
D) $R(x) = 80x - 20x^2$

15) The total cost to produce $x$ units of paint is $C(x) = (5x + 3)(7x + 4)$. Find the marginal average cost function.

A) $\overline{C}(x) = 70x + 41$ 
B) $\overline{C}(x) = 35x + 41 + \frac{12}{x}$ 
C) $\overline{C}(x) = 70 - \frac{41}{x}$ 
D) $\overline{C}(x) = 35 - \frac{12}{x^2}$

16) How long will it take for $8400$ to grow to $14600$ at an interest rate of 9.4% if the interest is compounded continuously? Round the number of years to the nearest hundredth.

A) 0.06 yr 
B) 5.88 yr 
C) 0.59 yr 
D) 58.81 yr

Differentiate.

17) Find $f(x)$ for $f(x) = 9e^{-6x}$

A) $f'(x) = -6e^{-6x}$ 
B) $f'(x) = 9e^{-6x}$ 
C) $f'(x) = 54e^{-6x}$ 
D) $f'(x) = -54e^{-6x}$

18) Find $f(x)$ for $f(x) = \ln(3x - 2)$.

A) $f(x) = \frac{3}{3x - 2}$ 
B) $f(x) = \frac{3}{\ln(3x - 2)}$ 
C) $f(x) = e^{3x-2}$ 
D) $f(x) = \frac{3x - 2}{3}$

Differentiate.

19) Find $f(x)$ for $f(x) = (5x^3 + 4)(3x^7 - 5)$.

A) $f(x) = 20x^9 + 84x^6 - 75x$ 
B) $f(x) = 20x^9 + 84x^6 - 75x^2$ 
C) $f(x) = 150x^9 + 84x^6 - 75x$ 
D) $f(x) = 150x^9 + 84x^6 - 75x^2$

20) Find $f'(t)$ for $f(x) = \frac{x}{8x - 9}$

A) $-\frac{9x}{(8x - 9)^2}$ 
B) $-\frac{9}{(8x - 9)^2}$ 
C) $-\frac{9}{8x - 9}$ 
D) $\frac{16x - 9}{(8x - 9)^2}$
Provide an appropriate response.
21) Write composite function \( y = (2x^4 + 3x + 1)^3 \) in the form \( y = f(u) \) and \( u = g(x) \).
   A) \( y = f(u) = (2x^4 + 3x + 1)^3 \) and \( u = g(x) = u \)  
   B) \( y = f(u) = u^3 \) and \( u = g(x) = 2x^4 + 3x + 1 \)  
   C) \( y = f(u) = 2x^4 + 3x + 1 \) and \( u = g(x) = u^3 \)  
   D) \( y = f(u) = u \) and \( u = g(x) = (2x^4 + 3x + 1)^3 \)

Find the derivative.
22) Find \( f'(x) \) for \( f(x) = (8x - 9)^{-4} \).
   A) \( -4 \frac{8}{(8x - 9)^5} \)  
   B) \( -4 \frac{32}{(8x - 9)^3} \)  
   C) \( -32 \frac{8x - 9}{5} \)  
   D) \( -32 \frac{8x - 9}{3} \)

23) Find \( \frac{dy}{dt} \) for \( y = (5t^2 - 4t)^2 \).
   A) \( 2(5t^2 - 4t)(10t - 4) \)  
   B) \( (5t^2 - 4t)(10t - 4) \)  
   C) \( 2(5t^2 - 4t) + (10t - 4) \)  
   D) \( 10t - 4 \)

24) Find \( y' \) for \( y = y(x) \) defined implicitly by \( 5y^2 - 8x^4 + 3 = 0 \), and evaluate \( y' \) at \( (x, y) = (1, 1) \).
   A) \( y' = \frac{11x^2}{5y^2} ; y'(1, 1) = \frac{11}{5} \)  
   B) \( y' = \frac{11x^3}{5y} ; y'(1, 1) = \frac{11}{5} \)  
   C) \( y' = \frac{16x^2}{5y^2} ; y'(1, 1) = \frac{16}{5} \)  
   D) \( y' = \frac{16x^3}{5y} ; y'(1, 1) = \frac{16}{5} \)

25) Assume \( x = x(t) \) and \( y = y(t) \). Find \( \frac{dx}{dt} \) if \( x^2(y - 6) = 12y + 3 \) and \( \frac{dy}{dt} = 2 \) when \( x = 5 \) and \( y = 12 \).
   A) \( \frac{13}{20} \)  
   B) \( -\frac{20}{13} \)  
   C) \( -\frac{13}{30} \)  
   D) \( \frac{20}{13} \)

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

26) Find the relative rate of change of \( f(x) = 150x - 0.08x^2 \).

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the elasticity of the demand function as a function of \( p \).
27) \( x = D(p) = 200 - p \)
   A) \( E(p) = \frac{p}{p - 200} \)  
   B) \( E(p) = p(200 - p) \)  
   C) \( E(p) = \frac{1}{200 - p} \)  
   D) \( E(p) = \frac{p}{200 - p} \)

Find the value.
28) Find \( f(1, 4) \) when \( f(x, y) = 2x + 4y - 8 \)
   A) \( 6 \)  
   B) \( 10 \)  
   C) \( 18 \)  
   D) \( 8 \)
Find the partial derivative.

29) Let \( z = f(x,y) = 9x^2 - 19xy + 5y^3 \). Find \( \frac{\partial z}{\partial x} \).

A) 18x - 19y  
B) -19x - 15y  
C) 18x + 19y^2  
D) -19x + 15y^2

Provide an appropriate response.

30) For \( f(x, y) = 6x^2 + 7xy^4 - 5y^2 + 8 \), find \( f_{xx}(x, y) + f_{yx}(x, y) \).

A) 28y^3  
B) 12 + 28xy^3  
C) 12  
D) 12 + 28y^3

31) Find \( f(x) \) if \( f'(x) = \frac{7}{x^4} \) and \( f(1) = 4 \).

A) -28x^{-5} - 3  
B) -\frac{7}{3}x^{-3} - 3  
C) f(x) = -\frac{7}{3}x^{-3} + \frac{19}{3}  
D) -28x^{-5} + 32

Find the integral.

32) \( \int (3x^8 - 7x^3 + 4) \, dx \)

A) \( \frac{1}{3}x^9 - \frac{7}{3}x^4 + 4x + C \)  
B) \( 9x^9 - \frac{7}{4}x^4 + 4x + C \)  
C) \( \frac{1}{3}x^9 - \frac{7}{4}x^4 + 4x + C \)  
D) \( 9x^9 - \frac{7}{3}x^4 + 4x + C \)

Solve the problem.

33) A company finds that consumer demand quantity changes with respect to price at a rate given by \( D'(p) = -\frac{3000}{p^2} \). Find the demand function if the company knows that 806 units of the product are demanded when the price is $5 per unit.

A) \( D(p) = \frac{3000}{p} + 206 \)  
B) \( D(p) = \frac{3000}{p^3} + 206 \)  
C) \( D(p) = \frac{6000}{p} + 806 \)  
D) \( D(p) = \frac{3000}{p^3} + 806 \)

Find the integral.

34) \( \int x^2 \sqrt{x^3 + 3} \, dx \)

A) \( -\frac{2}{3}(x^3 + 3)^{-1/2} + C \)  
B) \( \frac{2}{3}(x^3 + 3)^{3/2} + C \)  
C) \( \frac{2}{9}(x^3 + 3)^{3/2} + C \)  
D) \( 2(x^3 + 3)^{3/2} + C \)
Solve the problem.

35) The marginal price for a weekly demand of \( x \) bottles of cough medicine in a drug store is given by 
\[
p'(x) = \frac{-13,300}{(5x + 40)^2}.
\]
Find the price-demand equation if the weekly demand is 125 when the price of a bottle of cough medicine is $4. What is the weekly demand (to the nearest bottle) when the price is $3?

A) \( p(x) = \frac{5,320}{5x + 40} \); 347 bottles
B) \( p(x) = -\frac{2,660}{5x + 40} + 8 \); 98 bottles
C) \( p(x) = \frac{2,660}{5x + 40} \); 169 bottles
D) \( p(x) = \frac{5,320}{5x + 40} - 4 \); 144 bottles

Evaluate the integral.

36) \[ \int_1^3 (2x^3 - 4x^{-2}) \, dx \]

A) 45.83 | B) 37.33 | C) 48 | D) 56

37) \[ \int_{-1}^1 (3x^2 - 8x) \, dx \]

A) -7 | B) 7 | C) 12 | D) 2

Provide an appropriate response.

38) Find the average value of the function \( y = 2x^4 \) over the interval \([-2, 2]\).

A) \( \frac{32}{5} \) | B) \( \frac{128}{5} \) | C) 0 | D) \( \frac{16}{5} \)
Answer Key
Testname: REVIEWFINALE 40 PROBLEMS

1) D
2) D
3) B
4) D
5) B
6) D
7) A
8) C
9) A
10) A
11) B
12) B
13) D
14) C
15) D
16) B
17) D
18) A
19) D
20) B
21) B
22) C
23) A
24) D
25) C
26) \( \frac{150 - 0.16x}{150x - 0.08x^2} \)
27) D
28) B
29) A
30) D
31) C
32) C
33) A
34) C
35) C
36) B
37) D
38) A