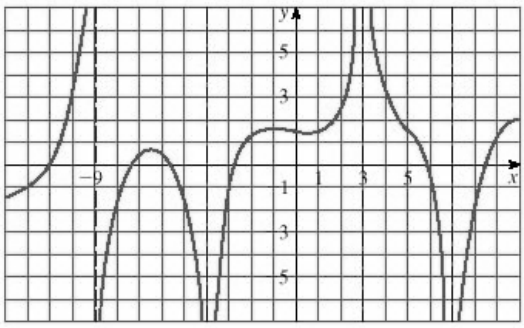
Name: _____ Class:___ Date: _____

1 For the function f whose graph is shown, state the following.

$$\lim_{x \to 7} f(x)$$



a. $-\infty$ b. 1 c. ∞ d. -4 e. 0

2 Given that,

$$\lim_{x \to 7} f(x) = -9 \text{ and } \lim_{x \to 7} g(x) = 10$$

Evaluate the limit:

$$\lim_{x \to 7} \frac{2f(x)}{g(x) - f(x)}$$

3 Evaluate the limit:

$$\lim_{x \to 3} (7x^2 + 2x + 6)$$

_____

4 Let

$$F(x) = \frac{x^2 - 64}{|x - 8|}$$

Find the following limits.

$$\lim_{x \to 8^+} F(x), \quad \lim_{x \to 8^-} F(x)$$

_____

5 Use continuity to evaluate the limit.

$$\lim_{x \to 4} \frac{5 + \sqrt{x}}{\sqrt{5 + x}}$$

a. ∞ b. $\frac{7}{3}$ c. $\frac{3}{3}$

6 Find a function g that agrees with f for $x \neq 36$ and is continuous on $\mathbb{R}$

$$f(x) = \frac{6 - \sqrt{x}}{36 - x}$$

7 Find an equation of the tangent line to the parabola $y = 3x^2 - 4x$ at the point $(1, -1)$.

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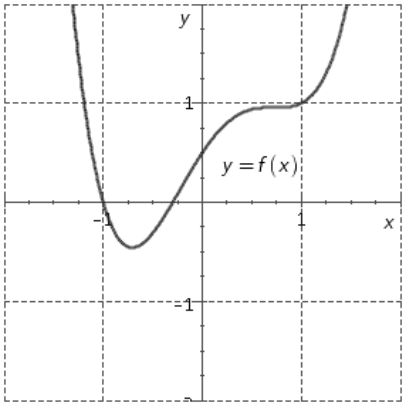
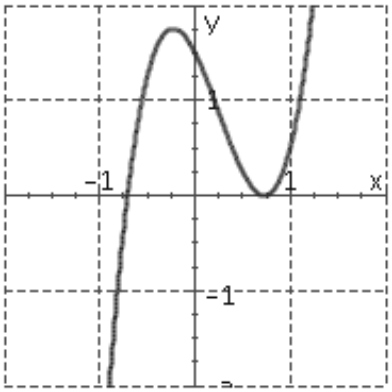
8 Sketch the graph of f' .



a.



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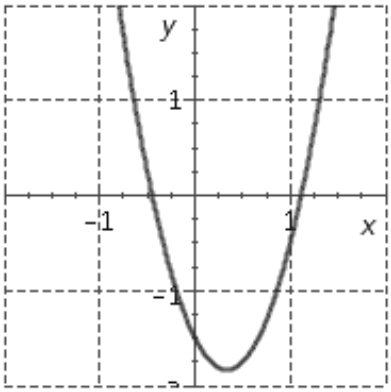

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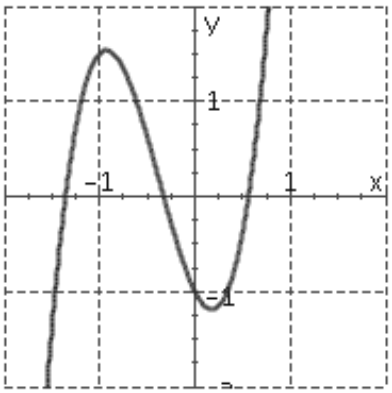
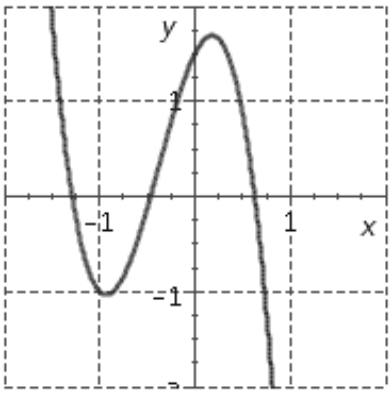
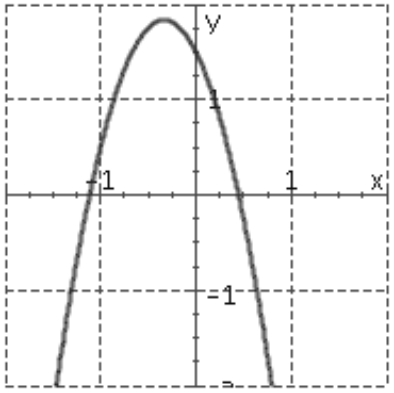


e.



..to be continued

continuation

c. 

9 Differentiate the function.

$$G(x) = \sqrt{x} - 4e^{x}$$

10 Find an equation of the tangent line to the curve at the given point.

$$y = x^{8} + 5e^{x},\ (0,\ 5)$$

11 Differentiate.

$$y = \frac{e^{x}}{1 + x}$$

12 Differentiate.

$$R(t) = \left(2t + e^{3t}\right)\left(3 - 2\sqrt{t}\right)$$

13 If f is a differentiable function, find an expression for the derivative of each of the following functions.

$$y = x^{4} f(x)$$

$$y = \frac{f(x)}{x^{4}}$$

$$y = \frac{x^{4}}{f(x)}$$

$$y = \frac{1 + x f(x)}{\sqrt{x}}$$

14 Differentiate. $g(x) = x^{2} \cos x$

15 Differentiate. $y = \dfrac{\sin x}{1 + \cos x}$

16 Write the composite function in the form $[f(g(x))]$.

$$y = \left(x^2 + 9x + 7\right)^3$$

Identify the inner function $u = g(x)$.

Identify the outer function $y = f(u)$.

Find the derivative $\frac{dy}{dx}$.

17 Suppose that *F(x) = f(g(x))* and *g(4)* = 8, *g'(4)* = 11, *f'(4)* = 20, and *f'(8)* = 19.
Find *F'(4)*.

_____

18 Find y' by implicit differentiation: $xy + 9x + 8x^2 = 3$.

_____

19 Find the first and the second derivatives of the function

$$y = \frac{x}{6 - x}$$

20 If $f(x) = 2\cos x + \sin^2 x$, find $f'(x)$ and $f''(x)$.

21 Differentiate the function: $f(t) = \frac{3 + \ln t}{8 - \ln t}$

22 Use logarithmic differentiation to find the derivative of the function.

$$y = x^{6x}$$

23 Find the critical numbers of the function:

$$y = 9x^2 + 36x$$

_____

24 Find the absolute minimum values of:

$$y = 7x^2 - 56x + 2$$

on the interval [0, 5].

_____

25 Find the absolute maximum value of:

$$y = \sqrt{16 - x^2}$$

on the interval $[-4, 4]$.

26 Verify that the function satisfies the hypotheses of The Mean Value Theorem on the given interval. Then find all numbers c that satisfy the conclusion of The Mean Value Theorem.

$$f(x) = \frac{x}{x + 2}, \quad [0, 1]$$

27 If $f(2) = 13$ and $f'(x) \geq 3$ for $2 \leq x \leq 9$, how small can $f(9)$ be?

28 Find the limit.

$$\lim_{x \to -9} \frac{x^2 + 1x - 72}{x + 9}$$

a. $-\infty$ b. ∞ c. 0 d. 1 e. -17

29 Find the limit.

$$\lim_{x \to 1} \frac{x^8 - 1}{x^5 - 1}$$

a. ∞ b. 1 c. 0 d. $-\infty$ e. $\frac{5}{8}$ f. $\frac{8}{5}$

30 Find the limit.

$$\lim_{x \to 0} \frac{e^x - 1}{\sin 10x}$$

31 Find the limit.

$$\lim_{x \to \infty} \frac{e^x}{x^8}$$

a. 0 b. $-\infty$ c. ∞ d. 8 e. 1

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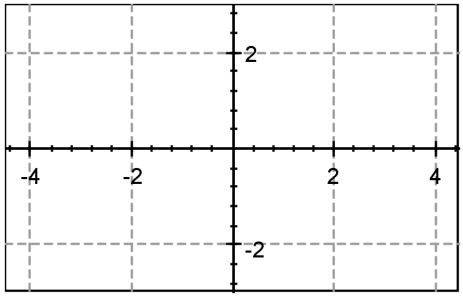
32 Sketch the curve.

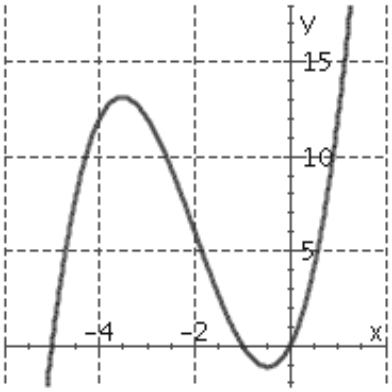
$$y = x^3 + x$$



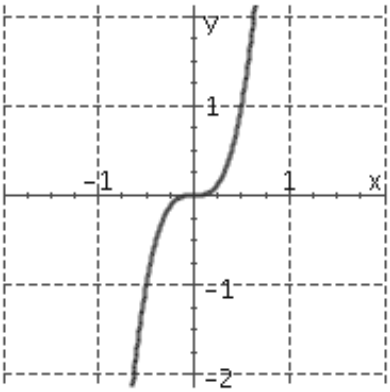
33 Sketch the curve.

$$y = x^3 + 6x^2 + 5x$$

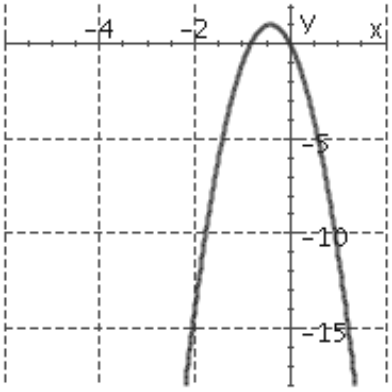
a.



c.

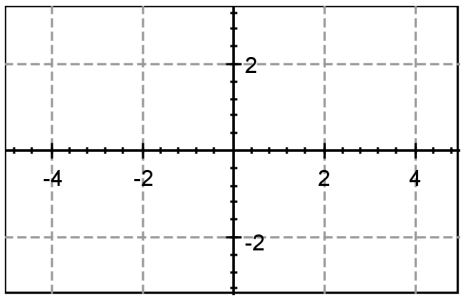


b.



34 Sketch the curve.

$$y = \frac{1}{x^2 - 9}$$



35 Find the most general antiderivative of the function:

$$f(x) = 6x^2 - 12x + 6$$

a. $F(x) = 10x^5 - 24x^4 + 6x + C$

b. $F(x) = 6x^3 - 12x^2 + 6x + C$

c. $F(x) = 2x^3 - 6x^2 + 6x + C$

36 Find the most general antiderivative of the function:

$$f(x) = \frac{2}{x^3}, \quad x > 0$$

37 Find f:

$$f''(x) = 81\cos(9x)$$

a. $f(x) = -\cos(9x) + Cx + D$

b. $f(x) = y = -\cos(9x) + Cx^2 + D$

c. $f(x) = y = 81\cos(x) + Cx + D$

38 Evaluate the integral by interpreting it in terms of areas.

$$\int_1^3 (1 + 6x)\, dx$$

a. 26 b. 14 c. 33

39 If $\int_4^{11} f(x)\, dx = 4.5$ and $\int_7^{11} f(x)\, dx = 1.2$, find $\int_4^7 f(x)\, dx$.

a. 3.3 b. 5.7 c. -3.3

40 Find *g'(x)* by evaluating the integral using Part 2 of the Fundamental Theorem and then differentiating.

$$g(x) = \int_{\pi}^{x} (3 + \cos(t))\, dt$$

a. $\frac{dg(x)}{dx} = 3 + \cos(x)$ b. $\frac{dg(x)}{dx} = -\sin(x)$ c. $\frac{dg(x)}{dx} = 3x + \sin(x)$

41 Use Part 1 of the Fundamental Theorem of Calculus to find the derivative of the function.

$$g(x) = \int_{1}^{x} \sqrt{7 + 8t}\, dt$$

42 Evaluate the integral. $\int_{0}^{3} \left(10 + 10y - y^2 \right) dy$

a. 129 b. − 24 c. 66 d. 84

43 Evaluate the integral $\int_{0}^{4} \sqrt{x}\, dx$. If entering a decimal, round to three decimal places.

_____

ANSWER KEY

Practice Final

1. a

2. $-\frac{18}{19}$

3. 75

4. $16, -16$

5. b

6. $g=\frac{1}{(6+\sqrt{x})}$

7. $y=2x-3$

8. a

9. $G'(x)=\frac{1}{2\sqrt{x}}-4e^{x}$

10. $y=5x+5$

11. $\frac{x\cdot e^{x}}{(1+x)^{2}}$

12. $R'(t)=\frac{6\sqrt{t}-6t+9e^{3t}\cdot\sqrt{t}-6t\cdot e^{3t}-e^{3t}}{\sqrt{t}}$

13. $y'(x)=4x^{3}\cdot f(x)+f'(x)\cdot x^{4}$, $y'(x)=\frac{f'(x)\cdot x-4f(x)}{x^{5}}$, $y'(x)=\frac{4x^{3}\cdot f(x)-f'(x)\cdot x^{4}}{(f(x))^{2}}$, $y'(x)=\frac{-1+x\cdot f(x)+2x^{2}\cdot f'(x)}{2x\cdot\sqrt{x}}$

14. $\frac{dg(x)}{dx}=2x^{1}\cdot\cos(x)-x^{2}\cdot\sin(x)$

15. $\frac{dy}{dx}=\frac{\cos(x)}{1+\cos(x)}+\frac{\sin^{2}(x)}{(1+\cos(x))^{2}}$

16. $u=x^{2}+9x+7$, $y=u^{3}$, $\frac{dy}{dx}=3\left(x^{2}+9x+7\right)^{2}\cdot(2x+9)$

17. 209

18. $\frac{(-9-y-16x)}{x}$

19. $6(6-x)^{-2}, 12(6-x)^{-3}$

20. $-2\sin(x)+\sin(2x), -2\cos(x)+2\cos(2x)$

21. $\frac{11}{\left(t\cdot(8-\ln(t))^{2}\right)}$

22. $6x^{6x}\cdot(\ln(x)+1)$

23. -2

24. -110

25. 4

26. $-2+\sqrt{6}$

27. 34

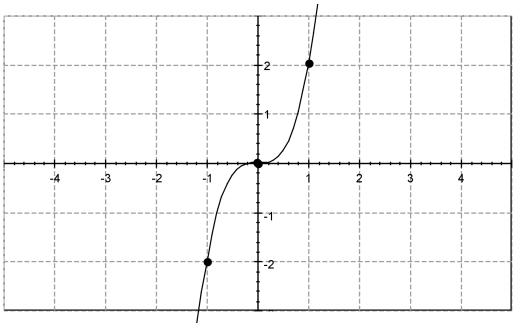
28. e

29. f

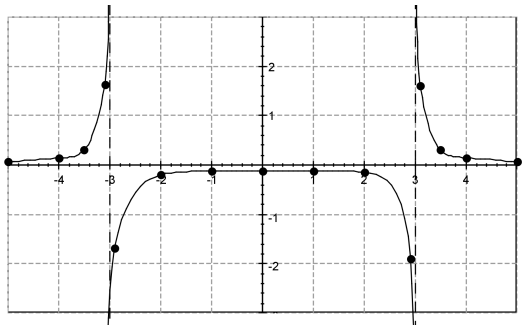
30. $\frac{1}{10}$

31. c

32.



33. a

34. 

35. c

36. $-\frac{1}{x^2}+C$

37. a

38. a

39. a

40. a

41. $\frac{dg(x)}{dx}=\sqrt{7+8x}$

42. c

43. 5.333333