Unit 5 MC and FR Practice

Name: _____ **Date:** _____

1. If $y = e^{x^2-3x}$, then $y' =$

   A. $(2x-3)e^{x^2-3x}$ B. $2x-3$ C. $(x^2-3x)e^{x^2-3x}$ D. $(2x-3)e^{2x-3}$

2. If $y = e^{1/x}$, then $y' =$

   A. $-\dfrac{e^{1/x}}{x^2}$ B. $e^{1/x}$ C. $\dfrac{e^{1/x}}{x}$ D. $xe^{1/x}$

3. If $y = e^{\cos x}$, then $\dfrac{dy}{dx} =$

   A. $-e^{\cos x}\sin x$ B. $e^{\cos x \sin x}$ C. $e^{\cos x}$ D. $e^x \cos x \sin x$

4. A curve is defined by $y = e^{\sin 2x}$. Find $\dfrac{dy}{dx}$.

   A. $2e^{\sin 2x}\cos 2x$ B. $\sin 2x \cos 2x$ C. $\sin 2x e^{\cos 2x}$ D. $4\sin 4x$

5. A function f is defined by $f(x) = \dfrac{e^x - e^{-x}}{2}$. Find $f'(x)$.

A. $\dfrac{e^x + e^{-x}}{x}$ B. $\dfrac{e^x - e^{-x}}{2}$ C. $\dfrac{e^x + e^{-x}}{2}$ D. $e^x + e^{-x}$

6. Differentiate with respect to x: $y = e^{7-(5/x)}$

A. $\dfrac{dy}{dx} = -e^{7-(5/x)}$ B. $\dfrac{dy}{dx} = e^{7-(5/x)}$ C. $\dfrac{dy}{dx} = \dfrac{5}{x^2}e^{7-(5/x)}$ D. $\dfrac{dy}{dx} = e^{6-(5/x)}$

7. Find y' given $y = e^{\sin\sqrt{x}}$.

A. $\dfrac{\cos\sqrt{x}}{2\sqrt{x}}e^{\sin\sqrt{x}}$ B. $(\cos\sqrt{x})e^{\sin\sqrt{x}}$ C. $(\sin\sqrt{x})e^{\sin\sqrt{x}-1}$ D. $\dfrac{(\sin\sqrt{x})e^{\sin\sqrt{x}}}{\sqrt{x}}$

8. $\dfrac{d}{dx}e^{\ln 5x} =$

A. $5^x(\ln 5)$ B. $e^x(\ln 5)$ C. $5^x(\ln 5 + e)$ D. 5

9. If $y = e^{\ln(\sin x)}$, then $\dfrac{dy}{dx} =$

A. $\ln(\cos x)$ B. $\cos x$ C. $\dfrac{\cos x}{\ln x}$ D. $\dfrac{\sin x}{\ln x}$

10. Given $f(x) = e^{\ln(x^2+3)}$, find $f'(x)$.

A. $2x$ B. 2 C. $\dfrac{e}{e^x + 3}$ D. $\dfrac{3}{xe^2 + 3}$

11. If $y = \ln(x^2 - x)$, then $\dfrac{dy}{dx} =$

A. $\dfrac{2x - 1}{x(x - 1)}$ B. $\dfrac{2x}{x(x - 1)}$ C. $\dfrac{2}{x}$ D. $\dfrac{x(x - 1)}{2x - 1}$

12. If $y = \ln \dfrac{2x}{3x + 4}$, then $\dfrac{dy}{dx} =$

A. $\dfrac{4}{(3x + 4)}$ B. $\dfrac{3x + 1}{x(3x + 4)}$ C. $\dfrac{-3}{x(2x - 3)}$ D. $\dfrac{3x + 4}{4}$

13. If $y = \ln(e^{3x} - 5)$, then $\dfrac{dy}{dx} =$

A. $\dfrac{1}{e^{3x} - 5}$ B. $\dfrac{3x - 5}{e^{3x} - 5}$ C. $\dfrac{3e^{3x}}{e^{3x} - 5}$ D. $e^{3x} - 5$

14. Find $\frac{dy}{dx}$ given $y = \ln(5-x)^6$.

A. $\frac{1}{(5-x)^6}$ B. $\frac{6}{x-5}$ C. $6(5-x)^5$ D. $-\frac{1}{5-x}$

15. Find the derivative of $f(x) = \ln(x^3+3x)^3$.

A. $\frac{9(x^2+1)}{x(x^2+3)}$ B. $\frac{3(x^2+1)}{x^3+3x}$ C. $\frac{3(x^2+1)}{x(x^3+3x)}$ D. $\frac{1}{9(x^2+1)(x^3+3x)^2}$

16. Find $\frac{dy}{dx}$ for $y = \ln\sqrt{x^2+4}$.

A. $\frac{2x}{\sqrt{x^2+4}}$ B. $\frac{x}{x^2+4}$ C. $\frac{1}{x}$ D. $e^x \cdot e^{x^2+4}$

17. If $f(x) = \ln(\sin(3x-8))$, then $f'(x) =$

A. $\frac{\cos(3x-8)}{\sin(3x-8)}$ B. $3\cos(3x-8)$ C. $3\ln(\cos(3x-8))$ D. $3\cot(3x-8)$

18. Find the derivative of $f(x) = \ln \dfrac{x(x^2+2)}{\sqrt{x^3-7}}$.

A. $\dfrac{x^2+2}{x} + \dfrac{2x^2}{x^2+2} + \dfrac{3x^2}{2(x^3-7)}$

B. $\dfrac{1}{x} + \dfrac{2x}{x^2+2} - \dfrac{3x^2}{2(x^3-7)}$

C. $\dfrac{1}{x} + \dfrac{2x}{x^2+2} + \dfrac{3x^2}{2(x^3-7)}$

D. $\dfrac{1}{x} - \dfrac{2x}{x^2+2} + \dfrac{3x^2}{2(x^3-7)}$

19. Let $y = 3^x x^3$. Find $\dfrac{dy}{dx}$.

A. $3^x x^2[3 + (\ln 3)x]$

B. $2x^2 3^{x-1}$

C. $3^{x-1}x^2[9 + x^2]$

D. $3x^2[3 - x \ln 3]$

20. Find y' given $xe^y + 1 = xy$.

A. $\dfrac{y - e^y}{xe^y - x}$

B. $\dfrac{y}{e^y - x}$

C. $\dfrac{e^y}{xe^y - 1}$

D. $\ln x$

21. Find y' given $3xe^y - 4 = x^2 y$.

A. 0

B. $\dfrac{2xy - 3e^y}{3xe^y - x^2}$

C. $\dfrac{e^y}{3xe^y - 4}$

D. $\ln 3x$

22. Let $ye^x - x = y^2$. Find y'.

A. $\dfrac{1 - ye^x}{e^x - 2y}$ B. $\dfrac{e^x - 1}{2}$ C. $\dfrac{1 + 2y}{e^x(1 - y)}$ D. $\dfrac{e^x - y}{e^x - 2y}$

23. Suppose $f(x) = x^3$ and let $h(x)$ be the inverse of f. Find $h'(-8)$.

A. $\frac{1}{12}$ B. $-\frac{1}{6}$ C. 12 D. $-\frac{1}{12}$

24. Suppose $f(x) = x^3 + 1$ and let $h(x)$ be the inverse of f. Find $h'(2)$.

A. $\frac{1}{3}$ B. 12 C. $\frac{1}{12}$ D. $-\frac{1}{12}$

25. $\displaystyle\int \tan 3x\, dx =$

A. $-\frac{1}{3}\ln|\cos 3x| + C$ B. $\frac{1}{3}\sec^2 3x$ C. $\ln|\cos 3x| + C$ D. $3\ln|\cos 3x| + C$

26. $\displaystyle\int \sec 2x\, dx =$

A. $\frac{1}{2}\ln|\sec 2x + \tan 2x| + C$ B. $\frac{1}{4}\sec^2 2x + C$

C. $\frac{1}{4}\csc 2x + C$ D. $\frac{1}{2}\ln|\tan 2x| + C$

27. $\int \csc 3x\, dx =$

A. $-\frac{1}{3}\ln|\csc 3x + \cot 3x| + C$

B. $\frac{1}{3}\csc^2 3x + C$

C. $3\csc 3x + C$

D. $\frac{1}{\ln}|\cot 3x| + C$

28. Which of the following is the indefinite integral for $\int cos^4(4x)\sin(4x)\, dx$?

A. $\frac{1}{4}\cos^4(4x) + C$

B. $4\cos^2(3x)\left(3\cos^2(3x) - \sin^2(3x)\right) + C$

C. $-\frac{1}{20}\cos^5(4x) + C$

D. $\frac{1}{20}\cos^4(4x) + C$

29. Evaluate: $\int \frac{\sin(\ln x)}{x}\, dx$

A. $\sin(\ln x) + C$

B. $\tan(\ln x) + C$

C. $-\cos(\ln x) + C$

D. $-\sin(\ln x) + C$

30. $\int (6x - 5)e^{3x^2-5x+4}\, dx =$

A. $e^{3x^2+2x} + C$

B. $e^{3x^2-5x+4} + C$

C. $e^{6x-5} + C$

D. $(3x^2 - 5x + 4)e^{3x^2-5x+4} + C$

31. If $\frac{dy}{dx} = \frac{6x+5}{3x^2+5x-2}$, then $y =$

A. $\frac{1}{3}\ln\left|3x^2+5x-2\right| + C$

B. $\ln\left|3x^2+5x-2\right| + C$

C. $\arctan(3x^2+5x-2) + C$

D. $6x\ln(3x^2+5x-2) + C$

32. $\int \frac{\ln 7x}{x} dx =$

A. $\frac{1}{2}(\ln 7x)^2 + C$

B. $2x\ln 7x - x + C$

C. $\frac{1}{7}\ln\frac{1}{7}x + C$

D. $7x\ln 7x + C$

33. Find the indefinite integral for $\int \frac{dx}{x(\ln(3x))}$.

A. $3\ln|\ln(3x)| + C$

B. $\ln|\ln(3x)| + C$

C. $\frac{1}{3}\ln 3x + C$

D. $\frac{1}{3}\ln|\ln(3x)| + C$

34. If $\frac{dy}{dx} = \frac{3}{4x\ln x}$, then $y =$

A. $3\ln 4x + C$

B. $4\ln 3x^x + C$

C. $\frac{3}{4}e^{\ln x} + C$

D. $\frac{3}{4}\ln(\ln x) + C$

35. Which of the following is the definite integral for $\int 10^x \, dx$?

A. $10^x + C$ B. $\ln 10 + C$ C. $\frac{10^x}{\ln 10} + C$ D. $10\frac{10^x}{\ln 10} + C$

36. Evaluate: $\int x\left(5^{x^2}\right) dx$

A. $\frac{5^{x^2}}{2\ln 5} + C$ B. $\frac{5^{x^2}}{\ln 5} + C$ C. $\frac{10^{x^2}}{2\ln 5} + C$ D. $\frac{e^{x^2}}{2\ln 5} + C$

37. If $\frac{dy}{dx} = e^{7x}$, then $y =$

A. $7e^{\frac{1}{7}x} + C$ B. $\frac{1}{7}e^{7x} + C$ C. $7e^{7x} + C$ D. $e^{7x} + C$

38. Evaluate: $\int 2^{3x} dx$

A. $\frac{3^{2x}}{2\ln 3} + C$ B. $\frac{1}{5}e^{3x} + C$ C. $\frac{2^{3x}}{3\ln 2} + C$ D. $\frac{3^{\frac{1}{3}x}}{2\ln 3} + C$

39. $\int \frac{1}{1-e^{-x}}\,dx =$

A. $\ln|e^x - 1| + C$ B. $\ln|1 - e^{-x}| + C$ C. $e^x + C$ D. $\ln|1 + e^{-x}| + C$

40. Evaluate: $\int \frac{5e^x}{e^x + 1}\,dx$

A. $5e^{\ln(x+1)} + C$ B. $5\ln(e^x + 5) + C$ C. $5\ln(e^x + 1) + C$ D. $\ln(e^x + 5) + C$

41. Evaluate: $\int \frac{1 + \cos x}{\sin x}\,dx$

A. $\ln|1 - \cos x| + C$ B. $x + \tan x + C$ C. $\sec x - \csc^2 x + C$ D. $x\sec x - \tan x + C$

42. Given a curve is defined by the equation $f(x) = (1 - \ln x)^2$. Find a point of inflection.

A. $(2e, e)$ B. $(1, 0)$ C. (e^{-2}, e) D. $(e^2, 1)$

43. Let $f(x) = \ln x^x$. Over what interval is the function increasing or decreasing?

A. increasing $0 < x < \frac{1}{e}$; decreasing $x > \frac{1}{e}$

B. increasing $x > e$; decreasing $1 < x < e$

C. increasing $x > \frac{2}{e}$; decreasing $0 < x < \frac{2}{e}$

D. increasing $x > \frac{1}{e}$; decreasing $0 < x < \frac{1}{e}$

44. Elvis drinks a 500 mL milkshake at Ye Olde Fountain Shoppe. Sadly, and unknown to Elvis, there is a crack in the glass that is getting wider with time, and the milkshake leaks out onto the counter at the rate $r(t) = \ln(t+1)$ mL/sec, for t seconds. Elvis drinks his milkshake at the constant rate of 10 mL/sec and begins drinking at the same time it starts leaking out (the instant he gets it), $t = 0$.

a) How fast is milkshake leaving the glass at time $t = 5$ seconds?

b) How much milkshake has left the mug at time $t = 5$ seconds?

c) Write an expression for $B(t)$, the volume of milkshake left in the glass at time t.

d) Elvis usually drinks a milkshake in 50 seconds. When will he actually finish it?

45. A particle moves along the x-axis with velocity given by $v(t) = \dfrac{2t^2 - 3}{t}$ for $t > 0$.

a) In which direction, left or right, is the particle moving at $t = 0.5$? Why?

b) Find the acceleration of the particle at time $t = 0.5$. Is the velocity increasing at $t = 0.5$? Why or why not?

c) Given that $x(t)$ is the position of the particle at time t and that $x(1) = -1$, find $x(4)$.

d) Find the total distance traveled by the particle from $t = 1$ to $t = 4$.

46. Suppose that the function f has a continuous second derivative for all x, and that $f(0) = 3, f'(0) = -5$, and $f''(0) = 0$. Let g be a function whose derivative is given by $g'(x) = e^{2x}(5f(x) + 3f'(x))$.

a) Write an equation of the line tangent to the graph of f when $x = 0$.

b) Is there sufficient information to determine whether or not the graph of f has a point of inflection when $x = 0$?. Explain your answer.

c) Given that $g(0) = 6$, write an equation of the line tangent to the graph of g at the point where $x = 0$.

d) Show that $g''(x) = e^{2x}(10f(x) + 11f'(x) + 3f''(x))$. Does g have a local maximum at $x = 0$? Justify your answer.

Unit 5 MC and FR Practice 11/19/2015

1. Answer: A

2. Answer: A

3. Answer: A

4. Answer: A

5. Answer: C

6. Answer: C

7. Answer: A

8. Answer: D

9. Answer: B

10. Answer: A

11. Answer: A

12. Answer: C

13. Answer: C

14. Answer: B

15. Answer: A

16. Answer: B

17. Answer: D

18. Answer: B

19. Answer: A

20. Answer: A

21. Answer: B

22. Answer: A

23. Answer: A

24. Answer: A

25. Answer: A

26. Answer: A

27. Answer: A

28. Answer: C

29. Answer: C

30. Answer: B

31. Answer: B

32. Answer: A

33. Answer: B

34. Answer: D

35. Answer: C

36. Answer: A

37. Answer: B

38. Answer: C

39. Answer: A

40. Answer: C

41.
Answer: A

42.
Answer: D

43.
Answer: D

44.
Answer: 11.792, 55.751 mL,
$500 - (t + 1)\ln(t + 1) - 11t$, 34.100

45.
Answer: Left: $v(0.5) < 0$, $a = 14$ yes, 9.841, 11.057

46.
Answer: $y = -5x + 3$, no, $y = 6$, yes