

MA 133 Chapter 3 Test

Indicate the answer choice that best completes the statement or answers the question.

1. Use the linear approximation of the function $f(x) = \sqrt{9-x}$ at $a = 0$ to approximate the number $\sqrt{9.08}$.

- a. 7.4445 b. 2.2556 c. 3.0133 d. 0.1556

2. Compute Δy and dy for the given values of x and $dx = \Delta x$.

$$y = x^2, x = 3, \Delta x = 0.5$$

- a. $\Delta y = 3.25, dy = 4.08$ b. $\Delta y = 3.25, dy = 3$ c. $\Delta y = 3, dy = 0$ d. $\Delta y = 4.08, dy = 0$

3. Find the limit.

$$\lim_{x \rightarrow 0} \frac{2\sin x}{x + 12\sin x}$$

- a. 0 b. $\frac{2}{13}$ c. $\frac{1}{6}$ d. $\frac{1}{2}$

4. Find the derivative of the function.

$$g(t) = \tan(\cos 2t)$$

- a. $-2 \sin 2t \sec^2(\cos 2t)$ b. $2 \sin 2t \sec^2(\cos 2t)$ c. $\sin 2t \sec^2(\cos 2t)$ d. $-\sin 2t \sec^2(\cos 2t)$

5. Find f' in terms of g' .

$$f(x) = [g(x)]^7$$

- a. $f'(x) = 7[g(x)]^6 g'(x)$ b. $f'(x) = 7g(x)$ c. $f'(x) = 7[gx][xg' + g]$ d. $f'(x) = 7[g'(x)]^6$

6. A plane flying horizontally at an altitude of 1 mi and a speed of 560 mi/h passes directly over a radar station. Find the rate at which the distance from the plane to the station is increasing when it is 2 mi away from the station.

- a. ≈ 485 mi/h b. ≈ 670 mi/h c. ≈ 495 mi/h d. ≈ 570 mi/h

MA 133 Chapter 3 Test

7. Find the rate of change of y with respect of x at the indicated value of x .

$$y = \csc x - 6 \cos x; \quad x = \frac{\pi}{6}$$

a. $3 + 2\sqrt{3}$ b. $3 + \frac{2\sqrt{3}}{3}$ c. $3 - \frac{2\sqrt{3}}{3}$ d. $3 - 2\sqrt{3}$

8.

The half-life of cesium-137 is 30 years. Suppose we have a 484-mg sample. Find the mass that remains after t years.

a. $684 \times 2^{-t/30}$ b. $634 \times 2^{-t/30}$ c. $584 \times 2^{-t/30}$ d. $534 \times 2^{-t/30}$

Enter the appropriate value to answer the question or solve the problem.

9. Find y''' , if $y = \sqrt{2x + 9}$.

10. The position function of a body moving along a coordinate line is

$$s(t) = 2 \sin t + 4 \cos t$$

where t is measured in seconds and $s(t)$ in feet. Find the position, velocity, speed, and acceleration of the body when $t = \frac{\pi}{2}$.

Enter the appropriate value to answer the question or solve the problem.

11. Calculate y' .

$$xe^y = y - 7$$

Indicate the answer choice that best completes the statement or answers the question.

12. Find the derivative of the function.

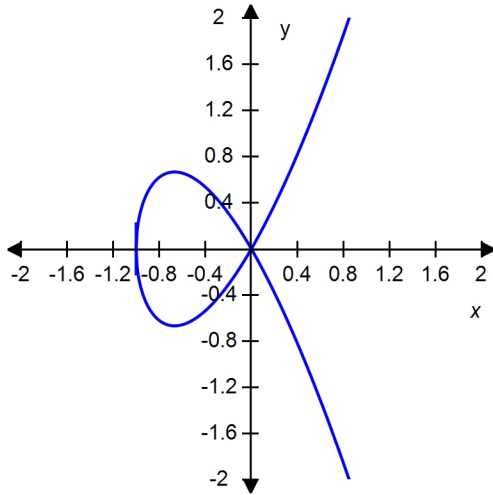
$$h(t) = \frac{t^8 - 9t^6 + 8t^5 e^t}{8t^5}$$

a. $8t^7 - 54t^5 + e^t$ b. $3t^2 - 9 + e^t$ c. $3t^2 - 9 + 8e^t$ d. $\frac{3}{8}t^2 - \frac{9}{8} + e^t$

MA 133 Chapter 3 Test

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

$$\frac{1}{3}y^2 - x^3 - x^2 = 0; (1, \sqrt{6})$$



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14. If $f(x) = \frac{x}{\ln x}$, find $f'(e^2)$.

- a. $\frac{1}{4}$ b. 2 c. 4 d. 0.2

15. $s(t)$ is the position of a body moving along a coordinate line, where $t \geq 0$, and $s(t)$ is measured in feet and t in seconds.

$$s(t) = -5 + 4t - t^2$$

- a. Determine the time(s) and the position(s) when the body is stationary.
 b. When is the body moving in the positive direction? In the negative direction?

MA 133 Chapter 3 Test

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16. Differentiate:

$$f(x) = (x^4 + 4x)e^x$$

a. $e^x(x^4 + 4x + 3x^4 + 4)$ b. $(7x^4 + 4x)e^x$ c. $(x^4 + 4x + 3x^4 + 4)x$ d. $e^x(x^4 + 4x + 4x^3 + 4)$

17. Find the instantaneous rate of change of the function $f(x) = \sqrt{7x}$ when $x = 7$.

a. 49 b. $\frac{1}{2}$ c. $\frac{1}{7}$ d. 7

18. When a cold drink is taken from a refrigerator, its temperature is 6°C . After 20 minutes in a 20°C room its temperature has increased to 12°C . What is the temperature of the drink after 40 minutes? Round your answer to one decimal place.

a. 15.4°C b. 14.0°C c. 16.0°C d. 20.0°C

19. Find the derivative of the function.

$$f(u) = e^u \sin u$$

a. $e^u \cos u$ b. $-e^u \cos u$ c. $e^u(\sin u - \cos u)$ d. $e^u(\sin u + \cos u)$

20. Differentiate the function.

$$f(x) = \cos(\ln(7x))$$

a. $f'(x) = -\sin(\ln(7x))$ b. $f'(x) = \frac{1}{\cos(\ln(7x))}$ c. $f'(x) = \frac{\sin(\ln(7x))}{x}$ d. $f'(x) = -\frac{\sin(\ln(7x))}{x}$

21. In calm waters, the oil spilling from the ruptured hull of a grounded tanker spreads in all directions. Assuming that the polluted area is circular, determine how fast the area is increasing when the radius of the circle is 20 ft and is increasing at the rate of $\frac{1}{6}$ ft/sec. Round to the nearest tenth if necessary.

MA 133 Chapter 3 Test

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22. Find the differential of the function.

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

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23. Find an equation of the line tangent to the graph of $y = \frac{e^{-4x}}{x^4 + 1}$ at the point where $x = 0$.

a. $y = 4x + 1$ b. $y = -4x$ c. $y = -4x + 1$ d. $y = 4x$

24. Find the derivative of the function.

$$f(x) = (2x - 1)^5$$

a. $f(x) = 10(2x - 1)^4$ b. $f(x) = 5(2x - 1)^4$ c. $f(x) = 10x(2x - 1)^4$ d. $f(x) = 5x(2x - 1)^4$

25. Suppose that $f(3) = -8$, $f'(3) = 7$, $g(3) = -1$, and $g'(3) = 3$. Find the value of $\left(\frac{f}{g}\right)'(3)$.

a. $\frac{17}{22}$ b. $\frac{17}{1}$ c. $-\frac{17}{-1}$ d. $-\frac{18}{1}$

26. Find $\frac{dy}{dx}$ by implicit differentiation.

$$e^{xy} - x^6 + y^6 = 3$$

a. $\frac{6x^5 - ye^{xy}}{xe^{xy} + 6y^5}$ b. $\frac{6x^5 - xe^{xy}}{ye^{xy} + 6y^5}$ c. $\frac{6y^5 - ye^{xy}}{xe^{xy} + 6x^5}$ d. $\frac{6y^5 - xe^{xy}}{ye^{xy} + 6x^5}$

27. Find an equation of the tangent line to the graph of the function at the indicated point.

$$f(x) = \frac{9}{x} \quad (9, 1)$$

a. $y = 9x + 2$ b. $y = \frac{1}{9}x + 2$ c. $y = -9x + 2$ d. $y = -\frac{1}{9}x + 2$

MA 133 Chapter 3 Test

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28. Find the limit.

$$\lim_{\theta \rightarrow 0} 4 \frac{\sin(\sin 4\theta)}{\sec 4\theta}$$

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29. Let $C(t)$ be the total value of US currency (coins and banknotes) in circulation at time t . The table gives values of this function from 1980 to 2000, as of September 30, in billions of dollars. Estimate the value of $C'(1990)$.

t	1980	1985	1990	1995	2000
$C(t)$	129.9	165.3	268.9	409.3	568.6

Answers are in billions of dollars per year. Round your answer to two decimal places.

a. 24.40 b. 137.45 c. 27.48 d. 44.45

MA 133 Chapter 3 Test**Answer Key**

1. c

2. b

3. b

4. a

5. a

6. a

7. d

8. d

9. $3(2x + 9)^{-5/2}$

10. Position: 2 ft

Velocity: -4 ft /sec

Speed: 4 ft /sec

Acceleration: -2 ft /sec²

11. $y' = -\frac{e^y}{xe^y - 1}$

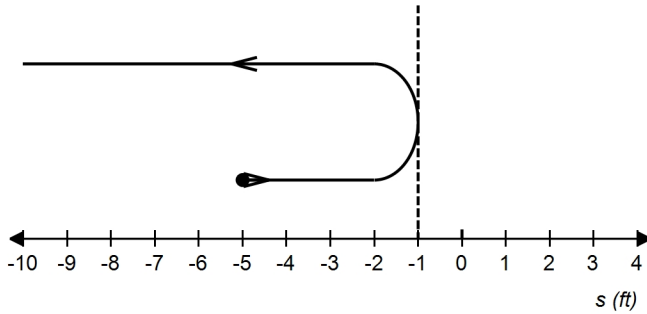
12. d

13. $y = \frac{5\sqrt{6}}{4}x - \frac{\sqrt{6}}{4}$

14. a

MA 133 Chapter 3 Test

15. a. $s(2) = -1$
 b. Positive when $0 < t < 2$, negative when $t > 2$
 c.



16. d
 17. b
 18. a
 19. d
 20. d
 21. $20.9 \text{ ft}^2/\text{sec}$
 22.
 $dy = (6x^5 + 5)dx$

23. c
 24. a
 25. b
 26. a
 27. d
 28. 0
 29. a