

Name _____

Find Δy for the given values of x_1 and x_2 .

1) $y = x^3 + 2x$; $x = 2$, $\Delta x = 0.01$

1) _____

A) 0.014

B) 0.07

C) 0.14

D) 0.007

2) $y = \frac{1}{x}$; $x = 10$, $\Delta x = -0.003$

2) _____

A) 0.00003

B) 0.03

C) 0.0003

D) 0.003

3) $y = 2x + 3$; $x = 18$, $\Delta x = 0.5$

3) _____

A) 0.5

B) 0.1

C) 1

D) 5

Use differentials to calculate the given number.

4) $\sqrt[3]{1.003}$

4) _____

Give your answer as a decimal.

A) 1.003

B) 1.001

C) 2.001

D) 1.01

5) $\sqrt{49.25}$

5) _____

Give your answer as a decimal. Round to 5 decimal places if necessary.

A) 7.01786

B) 8.75000

C) 7.87500

D) 6.12500

6) $\sqrt{28}$

Give your answer as a decimal. Round to 4 decimal places if necessary.

A) 4.7000

B) 8.0000

C) 5.6000

D) 5.3000

6) _____

Use the linear approximation $(1 + x)^k \approx 1 + kx$, as specified.7) Find an approximation for the function $f(x) = \frac{2}{1 - x}$ for values of x near zero.

A) $f(x) \approx 1 - 2x$

B) $f(x) \approx 2 - 2x$

C) $f(x) \approx 1 + 2x$

D) $f(x) \approx 2 + 2x$

7) _____

8) Estimate $(1.0006)^{50}$.

A) 1.012

B) 1.06

C) 1.006

D) 1.03

8) _____

Find dy .

9) $y = 2x^2 - 9x + 9$

A) $4x - 18 dx$

B) $(4x - 9) dx$

C) $4x dx$

D) $4x + 9 dx$

9) _____

10) $y = 5\sqrt{x} + \frac{5}{x}$

A) $\left(\frac{5}{2\sqrt{x}} - \frac{5}{x^2}\right) dx$

B) $\left(\frac{5}{2\sqrt{x}} + \frac{5}{x^2}\right) dx$

C) $\left(\frac{5\sqrt{x}}{2} + \frac{5}{x^2}\right) dx$

D) $\left(\frac{5\sqrt{x}}{2} - \frac{5}{x^2}\right) dx$

10) _____

11) $y = \sin(4x^2)$

A) $-8 \cos(4x^2) dx$

B) $8x \cos(4x^2) dx$

C) $8 \cos(4x^2) dx$

D) $-8x \cos(4x^2) dx$

11) _____

12) $y = 3 \cot\left(\frac{1}{4}x^4\right)$

12) _____

A) $3x^3 \csc^2\left(\frac{1}{4}x^4\right) dx$

B) $-3x^4 \csc^2\left(\frac{1}{4}x^4\right) dx$

C) $-3x^3 \csc\left(\frac{1}{4}x^4\right) dx$

D) $-3x^3 \csc^2\left(\frac{1}{4}x^4\right) dx$

The function $f(x)$ changes value when x changes from x_0 to $x_0 + dx$. Find the approximation error $|\Delta f - df|$. Round your answer, if appropriate.

13) $f(x) = x^2, x_0 = 4, dx = 0.04$

13) _____

A) 0.0008

B) 0.2816

C) 0.0016

D) 0.0032

14) $f(x) = x^3, x_0 = 6, dx = 0.05$

14) _____

A) 0.0225625

B) 0.0676875

C) 0.09025

D) 0.045125

15) $f(x) = x + x^2, x_0 = 2, dx = 0.06$

15) _____

A) 0.06072

B) 0.12144

C) 0.0072

D) 0.0036

Write a differential formula that estimates the given change in volume or surface area.

16) The change in the surface area $S = 4\pi r^2$ of a sphere when the radius changes from r_0 to $r_0 + dx$

16) _____

A) $dS = 2\pi r_0 dr$

B) $dS = 4\pi r_0^2 dr$

C) $dS = 8\pi r_0 dr$

D) $dS = 4\pi r_0 dr$

17) The change in the volume $V = \pi r^2 h$ of a right circular cylinder when the height changes from h_0 to $h_0 + dh$ and the radius does not change

17) _____

A) $dV = \pi r^2 h_0 dh$

B) $dV = \pi r_0^2 dr$

C) $dV = \pi r^2 dh$

D) $dV = 2\pi r h_0 dh$

The function $s = f(t)$ gives the position of a body moving on a coordinate line, with s in meters and t in seconds.

- 18) $s = 2t^2 + 4t + 7, 0 \leq t \leq 2$ 18) _____
Find the body's displacement and average velocity for the given time interval.
A) 30 m, 15 m/sec B) 16 m, 16 m/sec C) 12 m, 12 m/sec D) 16 m, 8 m/sec

- 19) $s = 8t^2 + 4t + 6, 0 \leq t \leq 2$ 19) _____
Find the body's speed and acceleration at the end of the time interval.
A) 36 m/sec, 32 m/sec² B) 20 m/sec, 2 m/sec²
C) 36 m/sec, 16 m/sec² D) 42 m/sec, 16 m/sec²

Solve the problem.

- 20) The position of a body moving on a coordinate line is given by $s = t^2 - 9t + 6$, with s in meters and t in seconds. When, if ever, during the interval $0 \leq t \leq 9$ does the body change direction? 20) _____
A) At $t = 18$ sec B) At $t = 4.5$ sec
C) At $t = 9$ sec D) No change in direction

- 21) At time t , the position of a body moving along the s -axis is $s = t^3 - 21t^2 + 144t$ m. Find the body's acceleration each time the velocity is zero. 21) _____
A) $a(6) = 0$ m/sec², $a(8) = 0$ m/sec² B) $a(6) = -6$ m/sec², $a(8) = 6$ m/sec²
C) $a(12) = 72$ m/sec², $a(16) = 12$ m/sec² D) $a(6) = 6$ m/sec², $a(8) = -6$ m/sec²

- 22) A ball dropped from the top of a building has a height of $s = 144 - 16t^2$ meters after t seconds. How long does it take the ball to reach the ground? What is the ball's velocity at the moment of impact? 22) _____
A) 3 sec, 96 m/sec B) 9 sec, -288 m/sec
C) 3 sec, -96 m/sec D) 6 sec, -48 m/sec

23) Suppose that the radius r and the circumference $C = 2\pi r$ of a circle are differentiable functions of t . Write an equation that relates dC/dt to dr/dt . 23) _____

A) $\frac{dC}{dt} = 2\pi \frac{dr}{dt}$

B) $\frac{dC}{dt} = \frac{dr}{dt}$

C) $\frac{dr}{dt} = 2\pi \frac{dC}{dt}$

D) $\frac{dC}{dt} = 2\pi r \frac{dr}{dt}$

24) Suppose that the radius r and volume $V = \frac{4}{3}\pi r^3$ of a sphere are differentiable functions of t . Write an equation that relates dV/dt to dr/dt . 24) _____

A) $\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$

B) $\frac{dV}{dt} = \frac{4}{3}\pi r^2 \frac{dr}{dt}$

C) $\frac{dV}{dt} = 3r^2 \frac{dr}{dt}$

D) $\frac{dV}{dt} = 4\pi \frac{dr}{dt}$

25) The area of the base B and the height h of a pyramid are related to the pyramid's volume V by the formula $V = \frac{1}{3}Bh$. How is dV/dt related to dh/dt if B is constant? 25) _____

A) $\frac{dV}{dt} = \frac{dh}{dt}$

B) $\frac{dV}{dt} = B \frac{dh}{dt}$

C) $\frac{dV}{dt} = \frac{B}{3} \frac{dh}{dt}$

D) $\frac{dV}{dt} = \frac{1}{3} \frac{dh}{dt}$

26) A company knows that the unit cost C and the unit revenue R from the production and sale of x units are related by $C = \frac{R^2}{102,000} + 6784$. Find the rate of change of unit revenue when the unit cost is changing by \$14/unit and the unit revenue is \$4000. 26) _____

A) \$280.00/unit

B) \$678.40/unit

C) \$428.45/unit

D) \$178.50/unit

27) Water is falling on a surface, wetting a circular area that is expanding at a rate of $9 \text{ mm}^2/\text{s}$. How fast is the radius of the wetted area expanding when the radius is 166 mm ? (Round your answer to four decimal places.) 27) _____

A) 0.0173 mm/s

B) 115.8898 mm/s

C) 0.0086 mm/s

D) 0.0542 mm/s

Solve the problem. Round your answer, if appropriate.

28) Water is discharged from a pipeline at a velocity v (in ft/sec) given by $v = 1064p^{(1/2)}$, where p is the pressure (in psi). If the water pressure is changing at a rate of 0.266 psi/sec, find the acceleration (dv/dt) of the water when $p = 32.0$ psi. 28) _____

- A) 25.0 ft/sec² B) 94.0 ft/sec² C) 30.1 ft/sec² D) 801 ft/sec²

29) As the zoom lens in a camera moves in and out, the size of the rectangular image changes. Assume that the current image is 7 cm \times 5 cm. Find the rate at which the area of the image is changing (dA/df) if the length of the image is changing at 0.8 cm/s and the width of the image is changing at 0.3 cm/s. 29) _____

- A) 14.2 cm²/sec B) 6.1 cm²/sec C) 12.2 cm²/sec D) 7.1 cm²/sec

30) A man 6 ft tall walks at a rate of 2 ft/sec away from a lamppost that is 24 ft high. At what rate is the length of his shadow changing when he is 55 ft away from the lamppost? (Do not round your answer) 30) _____

- A) $\frac{1}{5}$ ft/sec B) $\frac{2}{5}$ ft/sec C) $\frac{55}{3}$ ft/sec D) $\frac{2}{3}$ ft/sec

31) The radius of a right circular cylinder is increasing at the rate of 5 in./sec, while the height is decreasing at the rate of 3 in./sec. At what rate is the volume of the cylinder changing when the radius is 14 in. and the height is 11 in.? 31) _____

- A) $-68 \text{ in.}^3/\text{sec}$ B) $952\pi \text{ in.}^3/\text{sec}$ C) $182 \text{ in.}^3/\text{sec}$ D) $182\pi \text{ in.}^3/\text{sec}$

Find the linearization $L(x)$ of $f(x)$ at $x = a$.

32) $f(x) = 3x^2 - 2x - 5$, $a = -2$ 32) _____

- A) $L(x) = -10x - 17$ B) $L(x) = -14x - 17$ C) $L(x) = -10x + 7$ D) $L(x) = -14x + 7$

33) $f(x) = \sqrt[3]{x}$, $a = 8$

33) _____

A) $L(x) = \frac{1}{4}x + 4$

B) $L(x) = \frac{1}{4}x + \frac{2}{3}$

C) $L(x) = \frac{1}{12}x + \frac{4}{3}$

D) $L(x) = \frac{1}{12}x + \frac{2}{3}$

Write a differential formula that estimates the given change in volume or surface area.

34) The change in the surface area $S = 4\pi r^2$ of a sphere when the radius changes from r_0 to $r_0 + dx$

34) _____

A) $dS = 4\pi r_0^2 dr$

B) $dS = 2\pi r_0 dr$

C) $dS = 8\pi r_0 dr$

D) $dS = 4\pi r_0 dr$

Answer Key

Testname: 12FALL_CH3_APPLICATIONS_PRACTICE_PROBS

- 1) C
- 2) A
- 3) C
- 4) B
- 5) A
- 6) D
- 7) D
- 8) D
- 9) B
- 10) A
- 11) B
- 12) D
- 13) C
- 14) D
- 15) D
- 16) C
- 17) C
- 18) D
- 19) C
- 20) B
- 21) B
- 22) C
- 23) A
- 24) A
- 25) C
- 26) D
- 27) C
- 28) A
- 29) B
- 30) D
- 31) B
- 32) B
- 33) C
- 34) C