

1. If you drop a stone into a well and it hits the bottom 3 seconds later, how deep is the well? Assume acceleration is -32 ft/sec^2
2. Find the equation of the tangent line to $y = \ln(x^2)$ at $x = e^2$.
3. Find the vertical and horizontal asymptotes of $y = \frac{x^5 - 1}{1 - x^5}$
4. Find $\int \sec(2\theta) \tan(2\theta) d\theta$
5. Find $\lim_{x \rightarrow \infty} \sqrt{\frac{8 + x^2}{4x(x + 1)}}$
6. Find y' if $y = \cos^2(3x)$
7. A closed box with capacity 36 in^3 is needed. If the box must be twice as long as it is wide, what dimensions would require the least amount of material?
8. If $f(x) = \frac{x - 1}{x + 1}$, find $f'(1)$.
 - (a) -1
 - (b) $-\frac{1}{2}$
 - (c) 0
 - (d) $\frac{1}{2}$
 - (e) 1
9. A 10 ft ladder rests against a wall. If the bottom of the ladder slides away from the wall at $2 \frac{\text{ft}}{\text{sec}}$, how fast is the angle between the top of the ladder and the wall changing when the angle is $\frac{\pi}{4}$ radians?
10. Find the values of x for which $f(x) = 3x^5 - 20x^3$ is concave up.
11. Find $\int_0^{\frac{1}{2}} \frac{2x}{\sqrt{1 - x^2}} dx$
12. Find the rate the volume is increasing if the radius of a sphere is increasing at $.3 \frac{\text{in}}{\text{sec}}$ when the surface area is $100\pi \text{ in}^2$. HINT: $V = \frac{4}{3}\pi r^3$ and $SA = 4\pi r^2$

13. Find $\int_1^2 \frac{x-4}{x^2} dx$

(a) $-\frac{1}{2}$

(b) $\ln(2) - 2$

(c) $\ln(2)$

(d) 2

14. Find $f'(x)$ if $f(x) = \log_9(\sin^{-1}(x^4))$.

15. Find $f'(x)$ if $f(x) = (5^{\arctan(x^2)}) (e^{1/x})$

16. Use implicit differentiation to find y' if $\tan(xy) = y$.

17. Given

$$f(x) = \begin{cases} x+1 & \text{if } x < 0 \\ \cos(\pi x) & \text{if } x \geq 0 \end{cases}$$

find $\int_{-1}^1 f(x) dx$.

18. Find the area of the largest rectangle that is inscribed in the circle $x^2 + y^2 = a^2$.

19. Find the values of a if $\int_0^a 2x dx = 16$

20. A baseball diamond is a square with 90 ft sides. If a batter runs towards first base with a speed of $24 \frac{ft}{sec}$, at what rate is his distance from second base decreasing when he is halfway to first?

Answers

1) 144

11) $2 - \sqrt{3}$

2) $y - 4 = \frac{2}{e^2}(x - e^2)$

12) 30π

3) No VA, HA: $y = -1$

13) B

4) $\frac{1}{2} \sec(2\theta) + C$

14) $\frac{4x^3}{\sin^{-1}(x^4) \ln(9) \sqrt{1-x^8}}$

5) $\frac{1}{2}$

15) $\left(5^{\arctan(x^2)} \ln(5) \frac{2x}{1+x^4}\right) e^{1/x} - \frac{5^{\arctan(x^2)} e^{1/x}}{x^2}$

6) $y' = -6 \cos(3x) \sin(3x)$

16) $y' = \frac{y \sec^2(xy)}{1 - x \sec^2(xy)}$

7) $2.381 \times 4.762 \times 3.175$

17) $\frac{1}{2}$

8) D

18) $2a^2$

9) $\frac{d\theta}{dt} = \frac{\sqrt{2}}{5}$

19) $a = \pm 4$

10) $(-\sqrt{2}, 0) \cup (\sqrt{2}, \infty)$

20) -10.73