

1. Find the average rate of change of $f(x) = 4x - x^2$ on the interval $[1,3]$
2. Find the instantaneous rate of change of $f(x) = 4x - x^2$ at $x = 2$.
3. The average rate of change of $f(x) = mx + b$ on the interval $[a,c]$
 - a. 0
 - b. 1
 - c. m
 - d. $\frac{mc - ma + 2b}{c - a}$
 - e. $m(c - a)$
4. evaluate the following limit: $\lim_{h \rightarrow 0} \frac{e^{3+h} - e^3}{h}$
5. Find the derivative of $y = (x^3 + x)^5$
 - a. $3x^2 + 1$
 - b. $5(x^3 + x)^4$
 - c. $(15x^2 + 5)(x^3 + x)^4$
 - d. $\frac{1}{6}(x^3 + x)^6$
6. If $y = \sqrt{x^2 - 2x}$, then $y' =$
 - a. $\frac{1}{2}(x^2 - 2x)$
 - b. $\frac{1}{2}(x^2 - 2x)^{-1/2}$
 - c. $(x^2 - 2x)^{-1/2}(x - 1)$
 - d. $(x - 1)$
 - e. $(x^2 - 2x)(x - 1)$
7. If $y = e^{5x+5}$, then $y'(0) =$
 - a. e^5
 - b. 1
 - c. $5e^5$
 - d. 5
 - e. $\frac{1}{5}e^5$
8. given $f(x) = x \cos x$, find the second derivative
 - a. $-x \sin x$
 - b. $-\cos x$
 - c. $-x \cos x$
 - d. $-x \cos x - 2 \sin x$
 - e. $x \sin x$
9. $(\arctan 3x)' =$
 - a. $\frac{3}{1 + 3x^2}$
 - b. $\frac{3}{1 + x^2}$
 - c. $\frac{3}{1 + 9x^2}$
 - d. $\frac{1}{1 + 9x^2}$
 - e. $\frac{3x}{1 + 3x^2}$
10. find $\frac{d}{dx}(\arcsin(x^2))$

11. evaluate $\lim_{h \rightarrow 0} \frac{(1+h)^3 - 1}{h}$
12. the second derivative of $f(x) = \ln(x)$ at $x = 3$ is
- $-1/3$
 - $-1/9$
 - $1/9$
 - $1/3$
 - $2/3$
13. Find the equation of the normal line to the line tangent to $f(x) = \ln(3 - 2x)$ at $x = 1$
- $y = -2x + 1$
 - $y = \frac{1}{2}x + 1$
 - $y = \frac{1}{2}(x - 1)$
 - $y = \frac{1}{2}(x + 1)$
 - $y = -2x + 2$
14. the position equation for a particle is given as: $s(t) = t^2 - t$. The velocity of the particle after 2 seconds is:
- 0
 - 1
 - 2
 - 3
 - 4
15. the position equation for a particle is given as: $s(t) = t^2 - t$. The acceleration of the particle after 2 seconds is:
- 0
 - 1
 - 2
 - 3
 - 4
16. the position equation for a particle is given as: $s(t) = t^2 - t$. At what value(s) of t does the particle change direction?
- $t = 1/2$
 - $t = 1$
 - $t = 1$ and $t = 2$
 - $t = 2$
 - never
17. Find $\frac{dy}{dx}$ if $x^2 + y^2 = -2xy$
- 1
 - 1
 - $\frac{x - y}{x + y}$
 - $\frac{x + y}{x - y}$
 - $-\frac{x + 2y}{x}$
18. The equation of the tangent line to the graph of $x \cos y + y = x^2$ at the point $(1, 0)$ is
- $y = 2x$
 - $y = x$
 - $y = x - 1$
 - $y = -x + 1$
 - $y = -x$
19. Find the value of c guaranteed by the Mean Value Theorem for $f(x) = \ln(x)$ on the closed interval $[1, e^2]$

20. The function $f(x) = e^x - x + 2$ has
- A relative minimum at (0,3)
 - A relative minimum at (0,0)
 - A relative maximum at (0,3)
 - Two critical values
 - A relative minimum at (0,0) and a relative maximum at (0,3)
21. The absolute maximum of $y = \frac{x}{x^2 - 1}$ on the interval [2,4] is
- 0
 - 4/15
 - 2/3
 - 2
 - 4
22. on what interval is the graph of $f(x) = \ln(x^2 + 1)$ concave up?
- (0,1)
 - (-1,1)
 - (-0.5, 0.5)
 - $(-\frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3})$
 - the graph is never concave up
23. A rectangle is inscribed in the semicircle $y = \sqrt{4 - x^2}$. Find the largest possible area.
- 1.4
 - $\sqrt{3}$
 - $2\sqrt{3}$
 - 4
 - undefined
24. a piece of ice cut into a cube melts uniformly so that its volume decreases at $3\text{cm}^3/\text{sec}$. How fast is its surface area decreasing when the edge of the cube is 5 cm
- 12/25
 - 2.4
 - 3
 - 6
 - 150
25. a 20-ft ladder leans against the wall of a building. The ladder starts sliding down the wall so that the top of the ladder moves down at the rate of 0.5 ft/sec. How fast is the foot of the ladder moving away from the wall when the foot of the ladder is 12 feet from the wall.
- .5
 - 5/8
 - 2/3
 - 4/3
 - 8/3
26. The motion of a particle is given parametrically by $x(t) = 3t^2 - 3$, $y(t) = 2t + 1$. Find the slope of the tangent at $t = 1$.
- 1/3
 - 1
 - 2
 - 3
 - 6
- 27.
- sketch the function $f(x) = x - \sin(e^x)$ on the interval $[0, \pi]$.
 - Find its critical values and identify each as a relative max, min, or neither
 - State the intervals where the function is increasing
 - Find its points of inflection and state the intervals where the function is concave up.
 - Find the range of the function.