

- 1) Consider the equation of the line tangent to the graph of $y = (1 - 3x + x^2)(1 + x^2)$ at the point $(0, 1)$. In slope intercept form, the constant of this line equation is:
- a) -3 b) -1 c) 0 d) 1 e) none of these
- 2) The function $f(x) = x^3 + 3x$ is increasing and g is the inverse function of f . In lowest terms, the denominator of the value of $g'(3)$ is :
- a) 2 b) 3 c) 4 d) 5 e) none of these
- 3) Given: $A(u) = B(u^3 + 1)$, $B'(1) = \frac{1}{6}$, $B''(1) = -2$, $B'(2) = 3$, $B''(2) = \frac{1}{4}$
In lowest terms, the numerator of $A''(1)$ is
- a) 1 b) 9 c) 24 d) 81 e) none of these
- 4) $f(x) = 4x^4 - x^2 + 5$, and if (x_1, y_1) is a location of a local maximum then $x_1 + y_1 =$
- a) 0 b) 5 c) $\frac{\sqrt{8}}{8}$ d) $\frac{16+79\sqrt{8}}{16\sqrt{8}}$ e) none of these
- 5) If $f'(x) = \sqrt{x}$ and $f(1) = 2$, then in lowest terms, the numerator of the constant term of $f(x)$ is
- a) -1 b) 1 c) 2 d) 3 e) none of these
- 6) Find the area bounded by the graph of $f(x) = x^{(-2/3)}$, the horizontal x -axis, and the lines $x = 8$ and $x = 27$.
- a) 1 b) 6 c) 8 d) 9 e) none of these
- 7) State the value of $\int_0^1 (f(z) + g(z)) dz$ if $f(z) = \int_0^z t^3 dt$ and $g(z) = \int_0^1 zt dt$.
(Hint: When integrating f and g , treat z as a constant.)
- a) 0.3 b) 0.5 c) 2 d) 4 e) none of these
- 8) In lowest terms, the denominator of the volume of the solid formed by rotating the region under the graph of $y = 1 - x^2$ from $x = 0$ to $x = 1$ about the x -axis is
- a) 5 b) 15 c) 90 d) 120 e) none of these
- 9) $\int_{1/2}^{\sqrt{2}/2} \frac{dx}{\sqrt{1-x^2}} =$
- a) $\frac{1}{2}$ b) $\frac{\pi}{2}$ c) $-\frac{\pi}{12}$ d) $\frac{\pi}{12}$ e) none of these
- 10) For which values of x is $f(x) = \tan^{-1}\left(\frac{x^2}{\sqrt{3}}\right)$ increasing?
- a) $x > 0$ b) $-1 < x < 1$ c) $x > -1$ d) $0 < x < 1$ e) none of these

- 11) A definition of e is
- a) $\lim_{n \rightarrow \infty} (1 - \frac{1}{n})^n$ b) $\lim_{n \rightarrow 0} (1 - n)^{1/n}$ c) $\lim_{n \rightarrow \infty} (n - \frac{1}{n})^n$ d) $\lim_{n \rightarrow \infty} (\frac{n^2+1}{n})^n$ e) none of these
- 12) Given: $f(x)$ satisfies the hypotheses of the mean value theorem over the interval $[1, 3]$. The value(s) of C in this interval such that $f'(C) = \frac{f(3)-f(1)}{3-1}$ is (are):
- a) $4 + \sqrt{3}$ b) $4 - \sqrt{3}$ c) $4 \pm \sqrt{3}$ d) $\sqrt{3}$ e) none of these
- 13) The y -value of the inflection point on the graph of $y = x^{2/3}(x + 5)$ is
- a) 0 b) 1 c) 5 d) 6 e) none of these
- 14) A container with a square base, vertical sides and open top is to be made from 192 ft² of material. The height of the container with the maximum volume is
- a) 2 feet b) 4 feet c) $\sqrt{8}$ feet d) 8 feet e) none of these
- 15) $f(x) = x^5 + x^3 - 2x$. The minimum slope of the tangent lines to the graph of f is
- a) -2 b) -1 c) 0 d) 1 e) none of these
- 16) On which of the following intervals is $f(x) = \frac{1}{\sqrt{3-x}}$ continuous?
- a) $[3, \infty)$ b) $(-\infty, \infty)$ c) $(-\infty, 4)$ d) $[2, 3)$ e) none of these
- 17) $\frac{d^2y}{dx^2}$ where $x^2 + 3y^2 = 10$ can be written in the form $\frac{C}{y^3}$ where C is a constant. The value of C is
- a) $-\frac{1}{3}$ b) 10 c) $\frac{10}{3}$ d) $-\frac{10}{9}$ e) none of these
- 18) Which of the following statements about the graph of $f(x) = 2x^4 + x + 1$ is correct?
- a) There is a local minimum at $x = -\frac{1}{2}$ and a point of inflection at $x = 0$.
b) There is a local maximum at $x = -\frac{1}{2}$ and a point of inflection at $x = 0$.
c) There are no local extrema, but there is a point of inflection at $x = 0$.
d) There is a local minimum at $x = -\frac{1}{2}$, but there is no point of inflection.
e) none of these
- 19) The graph of $f(x) = 3x^4 - 4x^3 + 1$ is concaved down on the interval
- a) $(-\infty, 0)$ b) $(\frac{2}{3}, \infty)$ c) $(1, \frac{2}{3})$ d) a) and b) e) none of these
- 20) If $y = (\frac{1}{x} + \sin x)^{-1}$ then $y'(\pi) =$
- a) $\pi^2 + 1$ b) $\frac{-1}{\pi^2}$ c) $1 - \frac{1}{\pi^2}$ d) $1 - \pi^2$ e) none of these

- 21) Consider the perpendicular line, l , to the graph of $y = \sin(4 - x^2)$ at the point $(2, 0)$. An equation of l in the form $ax + by + c = 0$ where $a > 0$ is:
- a) $4x + y - 9 = 0$ b) $4x - y - 9 = 0$ c) $x - 4y - 2 = 0$ d) $x - 4y + 2 = 0$ e) none of these
- 22) A rectangle is to have an area of 32 in^2 . If the distance from one corner to the mid-point of a nonadjacent side is to be a minimum, then the sum of two adjacent side lengths is
- a) 12 in b) 18 in c) $\frac{28}{3}$ in d) $\frac{57}{5}$ in e) none of these
- 23) An ice cube is melting so its edge length is decreasing at the rate of 0.1 cm/second . How fast is the volume decreasing when the edge length is 2 cm ?
- a) $1 \text{ cm}^3/\text{sec}$ b) $1.2 \text{ cm}^3/\text{sec}$ c) $2 \text{ cm}^3/\text{sec}$ d) $2.1 \text{ cm}^3/\text{sec}$ e) none of these
- 24) A shark, looking for dinner, is swimming parallel to a straight beach and is 90 feet offshore. The shark is swimming at the constant speed of 30 feet per second. At time $= 0$, the shark is directly opposite a lifeguard station. How fast is the shark moving away from the lifeguard station when the distance between them is 150 feet?
- a) 12 ft/sec b) 18 ft/sec c) 36 ft/sec d) 48 ft/sec e) none of these
- 25) A particle is moving so that its velocity, $v(t) = t^2 - t - 2$ for $0 \leq t \leq 3$. The total distance traveled by the particle is
- a) $\frac{15}{2}$ units b) $\frac{3}{2}$ units c) $\frac{31}{6}$ units d) $\frac{34}{3}$ units e) none of these