

1. One statement is False about $f(x) = x|x|$ over $(-\infty, \infty)$

- (a) $f(x)$ is concave upward in its domain
- (b) $f'(0)$ exists
- (c) $f(x)$ is increasing on its Domain
- (d) $f(x)$ is an odd function
- (e) $f(x)$ has no global maximum value on its domain

(correct)

2. Using linear approximation of $f(x) = x^4$, the estimation value of $(1.999)^4$ is:

- (a) 15.968
- (b) 16.032
- (c) 16
- (d) 15.987
- (e) 15.999

(correct)

3. Let f and g be differentiable functions, such that $f(g(x)) = x$ and $f'(x) = 1 + (f(x))^2$, then $g'(1) =$

- (a) $\frac{1}{2}$
- (b) 1
- (c) 0
- (d) 2
- (e) $\sqrt{2}$

(correct)

4. The slope of the tangent line to the curve $x^y = y^x$, at the point $(1, 1)$ is:

- (a) 1
- (b) 0
- (c) e
- (d) $\frac{1}{e}$
- (e) \sqrt{e}

(correct)

5. The closest point on the line $y = 2x + 3$ to the origin is

(a) $\left(-\frac{6}{5}, \frac{3}{5}\right)$

(correct)

(b) $(0, 3)$

(c) $\left(-\frac{3}{2}, 0\right)$

(d) $\left(-\frac{3}{2}, 3\right)$

(e) $(-1, 1)$

6. Let $f(x) = \ln(1 - \ln x)$, the largest interval where f is decreasing is:

(a) $(0, e)$

(correct)

(b) (e, ∞)

(c) $(0, \infty)$

(d) $(0, 1)$

(e) $(1, e)$

7. $f(x) = e^{\tan^{-1} x}$ is concave up ward over the interval

(a) $\left(-\infty, \frac{1}{2}\right)$

(correct)

(b) $(-\infty, \infty)$

(c) $(-\infty, 1)$

(d) $\left(\frac{1}{2}, \infty\right)$

(e) $\left(\frac{\pi}{4}, \infty\right)$

8. The number satisfying the conclusion of the Mean Value Theorem of $f(x) = \frac{x}{x+2}$ over $[1, 4]$ is

(a) $3\sqrt{2} - 2$

(correct)

(b) $-3\sqrt{2} - 2$

(c) $3\sqrt{2} + 2$

(d) $3\sqrt{2}$

(e) 2

9. The local minimum value of $f(x) = 2 \cos x + \cos^2 x$ over $[0, 2\pi]$ is

- (a) -1
- (b) 1
- (c) 0
- (d) π
- (e) $-\pi$

(correct)

10. The Inflection point of $f(x) = (1 - x)e^x$ is

- (a) $\left(-1, \frac{2}{e}\right)$
- (b) $\left(-2, \frac{3}{e^2}\right)$
- (c) $(0, 1)$
- (d) $(1, 0)$
- (e) $\left(\frac{1}{2}, \frac{\sqrt{e}}{2}\right)$

(correct)

11. The horizontal asymptote of $f(x) = \left(\frac{x}{x+2}\right)^x$ is

(a) $y = e^{-2}$

(correct)

(b) $y = e^{-1}$

(c) $y = 1$

(d) $y = e$

(e) $y = 2$

12. The slant asymptote of

$$f(x) = x + \frac{1}{x}$$

is

(a) $y = x$

(correct)

(b) $y = x + 1$

(c) $y = x - 1$

(d) $y = x + \frac{1}{2}$

(e) $y = x - \frac{1}{2}$

13. Starting with $x_1 = -1$, using Newton's Method to find the second approximate root, x_2 , for $x^7 + 4 = 0$, gives:

(a) $-\frac{10}{7}$

(correct)

(b) $-\frac{4}{7}$

(c) $-\frac{12}{7}$

(d) $-\frac{8}{7}$

(e) $-\frac{9}{7}$

14. If the graph of a function $f(x)$ passes through $(1, 6)$ and the slope of its tangent line at $(x, f(x))$ is $2x + 1$, then $f(2) =$

(a) 10

(correct)

(b) 4

(c) 2

(d) 6

(e) 8

15. $\lim_{x \rightarrow 0^+} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right) =$

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

(correct)

(b) ∞

(c) 1

(d) e

(e) $-\frac{1}{e}$

16. $\lim_{x \rightarrow 0} x^4 \sin\left(\frac{1}{x}\right) =$

(a) 0

(correct)

(b) -1

(c) ∞

(d) 1

(e) $-\infty$