Math101 -- **Quiz#7&8** **Key solution** Name:

Serial No:

Solve and then select the correct answer:

---

1. The sum of the absolute maximum and the absolute minimum values of the function $f(x) = 2\cos x + 2\cos^2 x, \quad \frac{\pi}{2} \le x \le 2\pi$ is

   (a) 0

   (b) $\frac{7}{2}$

   (c) 1

   (d) $\frac{5}{2}$

   (e) -1

2. Given that $f(x) = \frac{x^2+1}{\sqrt{2x+1}}$, then the number of critical points of f is

   (a) 2

   (b) 4

   (c) 1

   (d) 3

   (e) 0

3. If $\cosh x = \frac{5}{3}$, and $x > 0$, the $\operatorname{csch} x =$

   (a) $\frac{2}{5}$

   (b) $\frac{3}{4}$

   (c) $\frac{4}{5}$

   (d) $\frac{5}{3}$

   (e) None of the above.

4. The function $f(x) = 5x^3 - 3x^5$ has

(a) 2 local extrema and one point of inflection

(b) 2 local extrema and 3 points of inflection

(c) 3 critical points and no points of inflection

(d) 2 local extrema and 2 points of inflection

(e) 2 critical points and 3 points of inflection

5. Let $f(x) = \cos^2(x) + \sin(x)$, $0 < x < \pi$. Which one of the following statements is **TRUE**:

(a) f is increasing on the interval $\left(0, \frac{\pi}{3}\right) \cup \left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$

(b) f is decreasing on the interval $\left(\frac{\pi}{6}, \frac{\pi}{2}\right) \cup \left(\frac{5\pi}{6}, \pi\right)$

(c) f is increasing on the interval $\left(\frac{\pi}{3}, \frac{2\pi}{3}\right)$

(d) f is decreasing on the interval $\left(\frac{\pi}{6}, \frac{\pi}{2}\right) \cup \left(\frac{2\pi}{3}, \pi\right)$

(e) f is decreasing on the interval $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$

6. If $f(x) = \tanh(1 + e^{2x})$, then $\left.\frac{df}{dx}\right|_{x=0} =$

(a) $\frac{2}{e^2 - 2 + e^{-2}}$

(b) $\frac{8}{e^4 + 2 + e^{-4}}$

(c) $\frac{4}{e^4 + 4 + e^{-4}}$

(d) $\frac{2}{e^4 + e^{-4}}$

(e) None of the above.

7. The value(s) of c satisfying the conclusion of the Mean Value Theorem for the function $f(x) = x + \frac{1}{x}$, on the interval $\left[\frac{1}{2}, 2\right]$ is (are)

(a) $\frac{1}{2}$ and $\frac{3}{2}$

(b) 1

(c) $\frac{1}{4}$ and 1

(d) -1 and 1

(e) 1 and $\frac{7}{4}$

8. The **number** of the critical points of $f(x) = |x^3 - 4x|$ is

(a) 5

(b) 2

(c) 3

(d) 4

(e) 1

9. If M and m are the absolute maximum and absolute minimum values respectively of the function $f(x) = x^3 - 3x^2 + 1$, $-\frac{1}{2} \leq x \leq 4$, then $M - m =$

(a) 18

(b) 10

(c) 16

(d) 20

(e) 14

10. Let $f(x) = x \ln x$. Then the graph of $f(x)$ is

(a) increasing on (e, ∞) and decreasing on $(0, e)$

(b) increasing on $(0, \infty)$

(c) deccreasing on $(0, \infty)$

(d) increasing on $\left(0, \frac{1}{e}\right)$ and decreasing on $\left(\frac{1}{e}, \infty\right)$

(e) increasing on $\left(\frac{1}{e}, \infty\right)$ and decreasing on $\left(0, \frac{1}{e}\right)$

11. If (α, β) is the point of inflection of the curve $f(x) = \tan x - 4x$ for $x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$, then $2\alpha - \beta + 2$

(a) 0

(b) 2

(c) $-\frac{\pi}{4}$

(d) $\frac{\pi}{4}$

(e) $1 - \pi$

12. Suppose that $f'(x) \leq 1$ for $1 \leq x \leq 4$. Then the largest possible value of $f(4) - f(1)$ is

(a) 8

(b) 3

(c) 5

(d) 6

(e) 4