King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

MATH 101 - Quiz # 5 - Term 171

Duration: 90 minutes

Name:_____ ID Number:_____

Section Number:_____

Class Time: _____

Instructions:

1. Calculators and Mobile Phones are not allowed.
2. Make sure that you have(Total of 20 Problems)
3. **Do not circle the answer in the exam paper, bubble only the OMR**.
4. You have **90 minutes** for this quiz.

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1. Let $f(x) = Ax^3 + 3x^2 + 2x + 1$. If $f(x)$ has a point of Inflection at $x = 1$, then $A =$

   a) 0
   b) 2
   c) -1
   d) 1
   e) -2

2. The function $f(x) = x^2 + \sin\, x + e^x$ over $[1, 13]$ has:

   a) one absolute minimum and no absolute maximum
   b) one absolute minimum and one absolute maximum
   c) one absolute maximum and no absolute minimum
   d) no absolute maximum and no absolute minimum
   e) two absolute minimum

3. If $f(x)$ is a function such that $f'(x) > 0$ and $f''(x) = 0$ for all x on (a, b) then, which one of the following statements is **True**:

   a) f is concave up on (a, b).
   b) f is concave down on (a, b).
   c) f has a point of inflection at c, $a < c < b$
   d) f is a linear function with positive slope
   e) f is a linear function with negative slope.

4. Rolle's theorem fails for $f(x) = \sqrt{x-1}$ on closed interval $[1, 2]$ because:

   a) f is not continuous on $[1, 2]$
   b) f is not differentiable on $(1, 2)$
   c) f is not defined throughout $[1, 2]$
   d) $f(1) = 0$
   e) $f(2) \neq 0$

5. The area of the largest rectangle that can be inscribed in a circle with radius 1 is equal to:

   a) $\sqrt{3}$
   b) 1
   c) $\sqrt{2}$
   d) $\sqrt{6}$
   e) 2

6. Given $f(x) = x + \cos x$ on $\left[0, \frac{\pi}{2}\right]$. The Mean Value Theorem tell us that there is a number x_0 between 0 and $\frac{\pi}{2}$ such that:

   a) $f'(x_0) = 1$
   b) $f'(x_0) = 1 - \frac{2}{\pi}$
   c) $f'(x_0) = \frac{2}{\pi}$
   d) $f'(x_0) = \left(\frac{1}{1 - \frac{2}{\pi}}\right)$
   e) $f'(x_0) = 0$

7. If $f(x) = \dfrac{x^2}{\sqrt{x+1}}$, then

a) $f(x)$ is decreasing on $(-1, 0)$ and increasing on $(0, \infty)$

b) $f(x)$ is positive and so increasing on its domain

c) $f(x)$ is increasing on $\left(-1, \dfrac{3}{4}\right)$ and decreasing on $\left(\dfrac{3}{4}, \infty\right)$

d) $f(x)$ is increasing on $\left(\dfrac{-4}{3}, -1\right)$, then decreasing on $(-1, \infty)$

e) $f(x)$ is increasing on $\left(-1, \dfrac{4}{3}\right)$, then decreasing on $\left(\dfrac{4}{3}, \infty\right)$.

8. The slant asymptote of $f(x) = \dfrac{x^2+1}{x+1}$ is

a) $y = x$

b) $y = x + 1$

c) $y = x - 1$

d) $y = 2x$

e) $y = 2x + 1$

9. $\lim\limits_{x \to 1} \left(\dfrac{x}{x-1} - \dfrac{1}{\ln x} \right)$ is equal to:

a) $1/2$

b) 1

c) 2

d) $-\ln 2$

e) $\ln 2$

10. $\lim_{x\to 0^+} (\cos x)^{1/x^2} =$

a) $\sqrt{e}$
b) e
c) 0
d) $\sqrt{e^{-1}}$
e) $\dfrac{1}{e \ln 2}$

11. If a snow ball melts so that its surface area decreases at a rate of $1\,cm^3/min$, then the rate at which the diameter decreases when the diameter is $10\,cm$ is

a) $-1/10\,\pi\,cm/min$
b) $-1/20\,\pi\,cm/min$
c) $-1/80\,\pi\,cm/min$
d) $-1/40\,\pi\,cm/min$
e) $-1/5\,\pi\,cm/min$

12. The linearization of $f(x) = x \ln x$ at $a = 1$ is

a) $-x$
b) $x + 1$
c) $2x - 1$
d) $x - 1$
e) x

13. The side of a cube is measured and found to be $20\,cm$ with maximum possible error of $0.5cm$. What is the maximum possible percentage error in the volume of the cube?

a) $10\,\%$
b) $5.5\,\%$
c) $2.5\,\%$
d) $5\,\%$
e) $7.5\,\%$

14. The sum of critical numbers of the function $f(x) = \dfrac{(x-4)^2}{\sqrt[3]{x+1}}$ is

a) 4
b) 1
c) 2
d) -1
e) -2

15. $\lim\limits_{x\to\infty} \dfrac{\sinh\, x}{e^x}$ is

a) ∞
b) 2
c) 0
d) $1/2$
e) $-\infty$

16. The dimension of the rectangle of the largest area that can be inscribed in a circle of radius r are:

a) $r/\sqrt{2}$ and $r/\sqrt{2}$
b) $r\sqrt{r}$ and $2\sqrt{r}$
c) $2/r$ and $2r$
d) $2r$ and $2r$
e) $\sqrt{2}\,r$ and $\sqrt{2}\,r$

17. $f(x) = \dfrac{\ln x}{x^2}$ has

a) $x = 0$ as a V.A. and y=0 as H.A
b) no asymptotes at all.
c) $x = e$ as a V.A.
d) no $y-$ intercept and two $H.A.$
e) $y = \dfrac{1}{2}$ as a $H.A.$

18. $f(x) = \dfrac{\ln x}{x^2}$ is increasing on

a) $(0, e^2)$
b) (e^2, ∞)
c) $(0, \sqrt{e})$
d) $(\sqrt{e}, \infty)$
e) $\left(0, \dfrac{1}{2}\,e\right)$

19. $f(x) = \tan^{-1}\left(\dfrac{x-1}{x+1}\right)$ has one inflection point when $x =$

a) $-\pi/4$
b) $\pi/4$
c) 0
d) 1
e) -1

20. One statement is **False** about $f(x) = \dfrac{x^2}{x^2+1}$

a) $f(x)$ is an even function
b) Range is $[0, 1]$
c) Domain is $(-\infty, \infty)$
d) $f(x)$ is decreasing on $(-\infty, 0)$
e) $y = 1$ is a H.A. for $f(x)$.