	A	B	C	D	E		A	B	C	D	E
1	O	O	O	O	O	11	O	O	O	O	O
2	O	O	O	O	O	12	O	O	O	O	O
3	O	O	O	O	O	13	O	O	O	O	O
4	O	O	O	O	O	14	O	O	O	O	O
5	O	O	O	O	O	15	O	O	O	O	O
6	O	O	O	O	O	16	O	O	O	O	O
7	O	O	O	O	O	17	O	O	O	O	O
8	O	O	O	O	O	18	O	O	O	O	O
9	O	O	O	O	O	19	O	O	O	O	O
10	O	O	O	O	O	20	O	O	O	O	O

Each question has 5 points.

SECTION-B

1) If $y = a^{2x}$, where a is a constant $y' =$?

A) $2lna.\, a^{2x}$ **B)** $2a^{2x}lna$ **C)** $2a^{2x-1}$

       D) $lna.\, lna^{2x}$ **E)** lna^{2x}

---

2) If $f(x) = x^5$, $(f^{-1})'(32) = $?

A) $\frac{1}{32}$ **B)** $\frac{1}{5}$ **C)** $\frac{1}{2}$ **D)** $\frac{1}{80}$ **E)** $\frac{1}{64}$

---

3) If $y = \tanh(lnx)$, $y' = $?

A) $\frac{cosh^2(lnx)}{x}$ **B)** $\frac{sech^2(lnx)}{x}$ **C)** $\frac{cosh(lnx)}{x}$

    D) $\frac{sech(lnx)}{x}$ **E)** $\frac{coth(lnx)}{x}$

---

4) If $y = x.\,arccosx - \sqrt{1-x^2}$, $y' = $?

A) $arccosx$ **B)** $arcsinx$ **C)** $arccosx - \frac{1}{\sqrt{1-x^2}}$

   D) $arccosx + \frac{1}{\sqrt{1-x^2}}$ **E)** $arccosx - \frac{x}{\sqrt{1-x^2}}$

---

5) Evaluate the following limit,

$$\lim_{x \to 1} \frac{3x^2 - 2x - 1}{x^2 - x} = ?$$

A) 0   **B)** 1   **C)** 2   **D)** 3   **E)** 4

---

6) $f: \mathbb{R}^+ \to \mathbb{R} - \{0\}, y = f(x)$

$$\sqrt{x} + \sqrt{y} = x^2 + y^2$$

is given. Find the value of $f'(1)$.

A) 1   **B)** $\frac{1}{2}$ **C)** 0   **D)** $-\frac{1}{2}$ **E)** -1

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7) $f: \mathbb{R} \to \mathbb{R}$

$$f(x) = \frac{x^3}{3} - x^2$$

is given. What is the sum of $\boldsymbol{a}$ values satisfying $\boldsymbol{f'(a).f''(a) = 0}$?

A) 0   **B)** 1   **C)** 2   **D)** 3   **E)** 4

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8)

$$\boldsymbol{y = \sqrt{u}}$$
$$\boldsymbol{u = t^2 + 1}$$
$$\boldsymbol{t = x^3 + 2x - 3}$$

is given, find $\frac{dy}{dx}$ at $\boldsymbol{x = 0}$.

A) $\frac{-11}{\sqrt{10}}$ **B)** $\frac{-6}{\sqrt{10}}$ **C)** 0   **D)** $\frac{3}{\sqrt{10}}$ **E)** $\frac{7}{\sqrt{10}}$

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9)

$$cot^2(x).\frac{d}{dx}\left(tan^3(x)\right)$$

is equivalent to

A) $3cot(x)$ **B)** $-1 + tan^2(x)$ **C)** $1 - tan^2(x)$

     D) $3sec^2(x)$ **E)** $-3sec^2(x)$

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10) Let f is a differentiable function.

$$\lim_{x \to 3} \frac{f(x) - f(3)}{x^2 - 9}$$

equals to

A) $\frac{f'(3)}{3}$ **B)** $\frac{f'(3)}{4}$ **C)** $\frac{f'(3)}{6}$ **D)** $\frac{f'(3)}{8}$ **E)** $\frac{f'(3)}{9}$

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11) Evaluate the following limit

$$\lim_{x \to \infty} \left(\frac{x - 4}{x + 1}\right)^{\frac{x}{3}} =?$$

A) e^{-1} **B)** $e^{-\frac{5}{3}}$ **C)** $e^{\frac{5}{3}}$ **D)** $e^{\frac{3}{5}}$ **E)** 0

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12) Evaluate the following limit

$$\lim_{x \to 0^+} (sin^{-1}(x))^x =?$$

A) 1   **B)** -1   **C)** 0   **D)** 2   **E)** -2

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13) Suppose that $f(0) = -7$ and $f'(x) \leq 12$ for all values of x. How large $f(3)$ possibly be?

A) 36   **B)** 29   **C)** 30   **D)** 0   **E)** -29

14) Using a linear approximation, compute $\sqrt[4]{16.02}$.

A) $2 + \frac{1}{3200}$ **B)** $1 + \frac{1}{1600}$ **C)** $\frac{1}{1600}$

D) $\frac{1}{3200}$ **E)** $2 + \frac{1}{1600}$

15) Using differentials, estimate

$$sin\left(\frac{\pi}{3} + 0.02\right) - sin\left(\frac{\pi}{3}\right).$$

A) $\frac{\sqrt{3}}{100}$ **B)** $\frac{\sqrt{3}}{200}$ **C)** $\frac{1}{100}$ **D)** $\frac{2}{100}$ **E)** 0

16) Find the points on the cardioid $r = 1 - \cos q$ at which there is a horizontal tangent line.

A) $\left(\frac{3}{2}, \frac{2p}{3}\right)$ and $\left(\frac{3}{2}, \frac{4p}{3}\right)$

B) $\left(2, p\right)$ and $\left(\frac{1}{2}, \frac{p}{3}\right)$

C) $\left(2, p\right)$ and $\left(\frac{1}{2}, \frac{5p}{3}\right)$

D) $\left(2, p\right)$ and $\left(0, 0\right)$

E) $\left(1, \frac{p}{2}\right)$ and $\left(0, 0\right)$

17) Find the rectangular coordinates of the point **P** whose polar coordinates are $(r, \theta) = (-6, \frac{5\pi}{3})$.

A) $\left(-3, \sqrt{3}\right)$ **B)** $\left(-3, 3\sqrt{3}\right)$ **C)** $\left(-3, 2\sqrt{3}\right)$

D) $\left(-3, -3\sqrt{3}\right)$ **E)** $\left(-3, -\sqrt{3}\right)$

18) Select the **FALSE** statement associated with the function $f(x) = \frac{x^2}{x-1}$.

A) f is increasing on $(-\infty, 0) \cup (2, \infty)$.
B) f is decreasing on $(0,1) \cup (1,2)$.
C) f is concave up on $(1, \infty)$.
D) f is concave down on $(-\infty, 1)$.
E) The graph of the function has one point of inflection and two relative extrema.

19) Consider the function $f(x) = \frac{x^3}{x^2 - 2x}$. Which of the following statement(s) is (are) true?

I. $f(x)$ has a vertical asymptote of $x = 2$.
II. $f(x)$ has a vertical asymptote of $x = 0$.
III. $f(x)$ has an oblique asymptote of $y = x + 2$.

A) None   **B)** I only   **C)** I and II only

D) I and III only   **E)** I, II and III

20) Which point on the graph of $y = 4 - x^2$ is closest to the point $(0,2)$ in the first quadrant?

A) $(0,4)$ **B)** $\left(\sqrt{3/2}, 5/2\right)$ **C)** $\left(\sqrt{2}, 2\right)$

D) $\left(\sqrt{1/2}, 7/2\right)$ **E)** $(2, 0)$