Name_____ ID_____

Important Note: Please show your work in order to get the full grade. There is only one point for the final answer and the rest will be for the details of the work.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Provide an appropriate response.

1) $\lim\limits_{x\to 1} \dfrac{2x^2 + x - 3}{x^2 + 4x - 5} =$ 1) _____

A) 0 B) $\frac{5}{6}$ C) $\frac{3}{5}$ D) $\frac{1}{4}$ E) $\frac{2}{5}$

2) If $f(x) = 3x - 7$, then $\lim\limits_{h\to 0} \dfrac{f(x+h) - f(x)}{h} =$ 2) _____

A) -7.
B) $3x$.
C) 0.
D) 3.
E) does not exist

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

3) Find: $\lim\limits_{x\to 4^-} \dfrac{3}{4 - x}$. If the limit does not exist, so state or use the symbol ∞ or $-\infty$ if appropriate. 3) _____

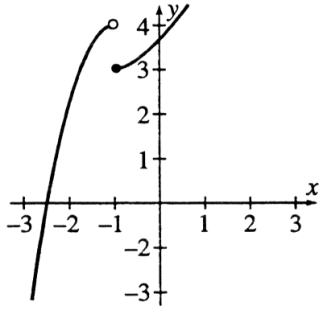
4) Find the following limit. If it is $+\infty$ or $-\infty$ or does not exist, then say so. 4) _____

$$\lim_{x\to\infty} \frac{3 - 5e^{2-3x}}{11}$$

5) By looking at the graph, give the following limits. 5) _____

(a) $\lim\limits_{x\to -1^+} f(x)$

(b) $\lim\limits_{x\to -1^-} f(x)$



6) 6) _____

Let $f(x) = \begin{cases} 2 - x^2 \text{ if } x > 1 \\ -2 + 3x \text{ if } 0 \le x \le 1 \\ 1 - x^2 \text{ if } x < 0 \end{cases}$

Find all points of discontinuity for this function.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

7) By the definition of a derivative, the derivative of $f(x) = \sqrt{x}$ is 7) _____

A) $\lim_{h \to 0} \frac{\left[\sqrt{x} + h - \sqrt{x}\right]}{h}$.

B) $\lim_{h \to 0} \frac{\sqrt{x + h} - \sqrt{x}}{h}$.

C) $\lim_{h \to 0} \frac{\sqrt{x + h}}{h}$.

D) $\lim_{h \to 0} \frac{\sqrt{x} + h}{h}$.

E) $\lim_{h \to 0} \frac{\left[\sqrt{x} + \sqrt{h}\right] - \sqrt{x}}{h}$.

8) An equation of the tangent line to the curve $y = 4x^2 - 6x - 5$ at the point $(-1, 5)$ is 8) _____

A) $y = -14x + 19$.
B) $y = (8x - 6)(x - 1) + 5$.
C) $y = 14x + 71$.
D) $y = -14x - 9$.
E) $y = 8x - 6$.

9) If $y = 2^2 + x$, then $\frac{dy}{dx} =$ 9) _____

A) 0. B) 2^2. C) 9.7. D) 1. E) 5.

10) If $p = 8m^2 - 9m + 3$, then the rate of change of p with respect to m when $m = 1$ is 10) _____

A) -9. B) 16. C) 2. D) 7. E) 1.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

11) Differentiate: $f(x) = (\sqrt{x} + \sqrt[5]{x})(2\sqrt{x} - \sqrt[3]{x})$ 11) _____

12) 12) _____

Find y' if $y = \left(\frac{x + 2}{x - 3}\right)^4$.

13) A particle travels along a straight line path according to the equation of motion $s = \sqrt{t^2 + 9}$ where t is in seconds and s is in meters. Find the velocity of the particle at $t = 4$. 13) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

14) 14) _____

If $y = \frac{1}{\sqrt[3]{5x^2 - 3}}$, then $\frac{dy}{dx} =$

A) $\frac{1}{\sqrt{10x - 3}}$.

B) $-\frac{1}{3(5x^2 - 3)\sqrt[3]{5x^2 - 3}}$.

C) $\frac{10x}{3\sqrt[3]{(5x^2 - 3)^2}}$.

D) $-\frac{10x}{3\sqrt[3]{(5x^2 - 3)^4}}$.

E) $-\frac{10x^2}{3\sqrt[3]{(5x^2 - 3)^4}}$.

15) An equation of the tangent line to the curve $y = \sqrt{x^2 - 9}$ at the point where $x = 5$ is 15) _____

A) $y = \frac{5}{4}x - \frac{9}{4}$.

B) $y = 2x - 6$.

C) $y = \frac{5}{4}x + \frac{9}{4}$.

D) $y = 2x + 6$.

E) $y = \frac{1}{4}x + \frac{11}{4}$.

16) If $g(x) = x^4(2x - 1)^{10}$, then $g'(1) =$ 16) _____

A) 24. B) 0. C) 1. D) 80. E) 14.

17) If $y = u^5 - 8u^2 + 2u - 1$ and $u = \sqrt{x + 10}$, find $\frac{dy}{dx}$ when $x = -9$. 17) _____

A) 0 B) $-\frac{9}{2}$ C) -1 D) -9 E) 1

18) If $y = (\ln 2)^2$, then $\frac{dy}{dx} =$ 18) _____

A) $2e^{\ln 2}$. B) $\frac{1}{(\ln 2)^2}$. C) 0. D) 2 ln 2. E) $e^{\ln 2}$.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

19) If $y = \ln\left(\frac{\sqrt{x^3 + 3x - 1}}{\sqrt{x^2 + 2x - 1}}\right)$, then find $\frac{dy}{dx}$. 19) _____

20) Find y' if $\ln(xy) + y = 2$. 20) _____

21) Find y' if $y = \frac{xe^x}{x + 1}$. 21) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

22) If $f(x) = e^{(4x+1)^2}$, then $f'(x) =$ 22) _____

A) $e^{2(4x+1)}$.

B) $2(4x + 1)e^{(4x+1)^2}$.

C) $8(4x + 1)e^{(4x+1)^2}$.

D) $(4x + 1)e^{(4x+1)^2 - 1}$.

E) $e^{8(4x+1)}$.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

23) Find $\frac{dy}{dx}$ if $4x^2y - xe^y = x - y + 2$ 23) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

24) If $f(x) = x^{3x + 1}$, then $f'(x) =$ 24) _____

A) $x^{3x + 1}\left[\frac{3x + 1}{x} + 3 \ln x\right]$.

B) $(2x + \ln x)x^{3x + 1}$.

C) $(\ln x)x^{3x}$.

D) $(3x + 1)x^{3x}$.

E) $\frac{3x + 1}{x} + 3 \ln x$.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

25) If $y = x \ln x$, then find $y^{(4)}$. 25) _____

26) If $e^y + y + x = 2$, use implicit differentiation to find $\frac{d^2y}{dx^2}$ and simplify your answer. Note: 26) _____

$\frac{dy}{dx}$ should not appear in your final answer.