MATH 1910 Practice for EXAM I

Please place the letter of your selection in the blank provided. These questions are worth five points each.

5 pts 1. _____The function f below has a discontinuity when $b = 0$. Which of the functions shown is equal to the function f when $b \neq 0$?

$$f(b) = \left(\frac{1}{b}\right)\left(\frac{1}{b^2-1} + \frac{1}{b^2+1}\right)$$

(a) $g(b) = \dfrac{1}{b-1} + \dfrac{1}{b^2+1}$ (b) $g(b) = \dfrac{1}{b-1} + \dfrac{1}{b+1}$

(c) $g(b) = \dfrac{2b}{(b^2-1)(b^2+1)}$ (d) $g(b) = \dfrac{2}{(b^2-1)}$

(e) $g(b) = \dfrac{1}{b-1}$

5 pts 2. _____The function $f(x) = \dfrac{x^2-1}{x^2+2x+1}$ has a removable discontinuity

(a) at no value of x. (b) only at $x = 1$.
(c) only at $x = 0$, $x = 1$, and $x = -1$ (d) only at $x = -1$ and $x = 1$.
(e) only at $x = -1$.

Problems 3-5 refer to the function whose formula is given below.

$$f(x) = \begin{cases} \dfrac{3}{x^2} & \text{if} \quad x \leq -2 \\ \dfrac{x-1}{x-2} & \text{if} \quad -2 < x \end{cases}$$

5 pts 3. _____Does the function f have a vertical asymptote?

(a) No. (b) Yes, only at $x = 0$.
(c) Yes, only at $x = 2$. (d) Yes, only at $x = 0$ and $x = 2$.
(e) Yes, only at $x = 1$.

5 pts 4. _____Does the function f have any jump discontinuities?

(a) No, the function is continuous. (b) Yes, only at $x = -2$.
(c) Yes, only at $x = 0$. (d) Yes, only at $x = 2$ and $x = -2$.
(e) Yes, only at $x = 0$, $x = 2$, and $x = -2$. .

5 pts 5. _____Which of the following statements is true at $x = -2$?

(a) f is undefined. (b) $f(-2) = 3/4$.
(c) f has a removable discontinuity. (d) f has a vertical asymptote.
(e) $f(-2) = -2$.

5 pts 6. _____Consider the function f and the three statements below.

$$v = f(y) = \frac{1 + 3\sqrt{y}}{y - 2}$$

I. We know that $f(y) = \dfrac{3}{\sqrt{y}}$.

II. We know that $\lim_{y \to +\infty} f(y) = \lim_{y \to +\infty} \dfrac{3}{\sqrt{y}}$.

III. We know that the function f has a horizontal asymptote at the line $v = 0$.

(a) All three statements are true.

(b) Only Statements I and II are true.

(c) Only Statements II and III are true.

(d) Only Statements I and III are true.

(e) None of these statements is true.

5 pts 7. _____What is the average rate of change for the function $y = f(x) = \dfrac{2 + 3x^{3/2}}{x}$ on the input interval $1 \leq x \leq 9$?

(a) Approximately 5.00

(b) Approximately 1.153

(c) Approximately 9.22

(d) Approximately 4.22

(e) Approximately 0.528

5 pts 8. _____Sarah started walking from her house to a store three miles away at 3:00 PM. Which of the following is a properly defined *varying* quantity in this situation?

(a) the distance from Sarah's house to the store, measured in feet

(b) the time

(c) the distance in feet that Sarah has walked from her house since 3:00 PM

(d) the total distance in miles that Sarah has walked when she arrives at the store

(e) Sarah

Problems 9 and 10 refer to the following scenario. Toby is traveling toward Knoxville on Interstate 40. Let d represent the number of miles Toby has driven since taking the on-ramp, and let t represent the number of minutes passed since Toby passed a rest-stop located two miles from the on-ramp. Once past the rest-stop, for every increase of five miles since Toby got on the on-ramp, the time since Toby passed the rest-stop increases by three minutes.

5 pts 9. _____ Which of the following formulas is correct?

(a) $d = \dfrac{5}{3}\Delta t$

(b) $\Delta t = \dfrac{5}{3}\Delta d$

(c) $t = \dfrac{3}{5}d$

(d) $\Delta t = \dfrac{3}{5}\Delta d$

(e) More than one of these statements is true.

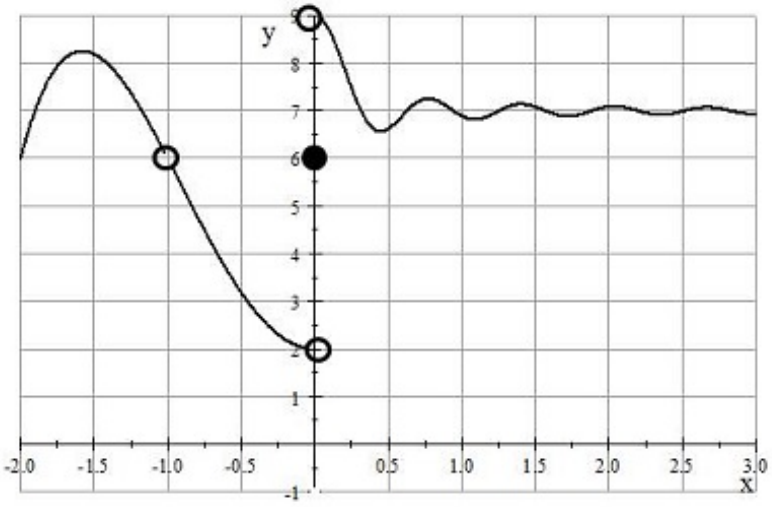
5 pts 10. _____ Eight minutes after passing the rest-stop, Tody is eleven miles from the on-ramp. How many minutes have elapsed since Toby passed the rest-stop when he is six miles from the on-ramp?

(a) 11 minutes (b) 5 minutes

(c) $3\frac{1}{3}$ minutes (d) $16\frac{1}{3}$ minutes

(e) $-\frac{1}{3}$ minute

Problems 11-13 refer to the function $y = f(x)$ whose graph is given below.



5 pts 11. _____According to the graph above, we have

(a) $\lim_{x \longrightarrow 0^+} f(x) = 2$ (b) $\lim_{x \longrightarrow 0^+} f(x) = 9$

(c) $\lim_{x \longrightarrow 0^+} f(x) = 6$ (d) $\lim_{x \longrightarrow 0^+} f(x) = 5$

(e) $\lim_{x \longrightarrow 0^+} f(x)$ does not exist

5 pts 12. _____According to the graph above, we have

(a) $\lim_{x \longrightarrow -1} f(x)$ does not exist (b) $\lim_{x \longrightarrow -1} f(x) = 1$

(c) $\lim_{x \longrightarrow -1} f(x) = 6$ (d) $\lim_{x \longrightarrow -1} f(x) = 0$

(e) $\lim_{x \longrightarrow -1} f(x) = 0$

5 pts 13. _____According to the graph above, we know that

(a) $\lim_{x \longrightarrow +\infty} f(x)$ does not exist (b) $\lim_{x \longrightarrow +\infty} f(x) = 0$

(c) $\lim_{x \longrightarrow +\infty} f(x) = -\infty$ (d) $\lim_{x \longrightarrow +\infty} f(x) = +\infty$

(e) $\lim_{x \longrightarrow +\infty} f(x) = 7$

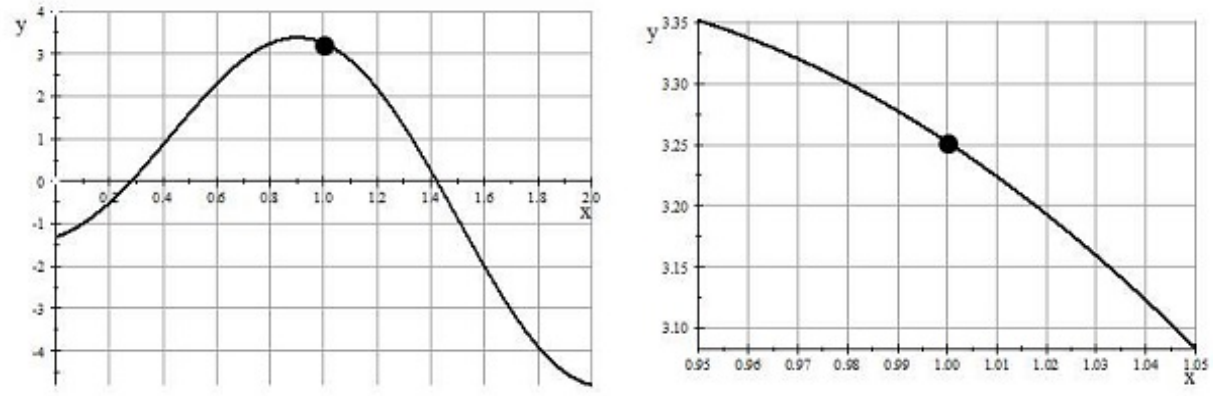
5 pts 14. _____ If $f(x) = \dfrac{1}{x-1}$, which of the following functions gives the average rate of change for f from $x = a$ to $x = a + h$ for nonzero values of h?

(a) $g_a(h) = -\dfrac{1}{(a-1)(a-1+h)}$ (b) $g_a(h) = -\dfrac{h}{(a-1)^2}$

(c) $g_a(h) = \dfrac{1}{a^2-1+h}$ (d) $g_a(h) = \dfrac{1}{h(a^2-1)}$

(e) $g_a(h) = -\dfrac{h}{(a-1+h)^2}$

5 pts 15. _____ The diagram below shows the graph of a function f along with a zoom-in on the point $(1.00, 3.252)$. What is the approximate local constant rate of change for $f(x)$ with respect to x near the input value $x = 1.00$?



(a) Approximately 3.00 (b) Approximately -1.25

(c) Approximately -2.40 (d) Approximately 2.70

(e) Approximately -3.00

5 pts 16. _____ If $f(x) = x + \sqrt{x}$, then the function g_4 that gives the average rate of change for f on the interval from $x = 4$ to $x = 4 + h$ is given by

$$g_4(h) = 1 + \frac{\sqrt{4+h} - 2}{h}$$

What would be the approximate local constant rate of change of $f(x)$ with respect to x near $x = 4$?

(a) Approximately 3.00 (b) Approximately 0.24

(c) Approximately 2.12 (d) Approximately 1.25

(e) Approximately 0.33

5 pts 17. _____ Let $y = f(x)$ be a function that is locally linear at the point $(-1, f(-1))$, and suppose that $y = -2.27(x + 1) - 4.18$ is the formula for the tangent line to the graph of f at the point $(-1, f(-1))$. Which of the following statements would be true about the *average rate of change* for the function f on the input interval $-1.01 \le x \le -1$?

(a) It would be approximately 2.27. (b) It would be approximately -2.27.

(c) It would be approximately 4.18. (d) It would be approximately -4.18.

(e) It would be approximately 2.27/4.18.

5 pts 18. _____ What can be said about the limiting process $\lim_{x\to-\infty} \dfrac{\sqrt{1+9x^2}}{4x-2}$?

(a) $\lim_{x\longrightarrow--\infty} \dfrac{\sqrt{1+9x^2}}{4x-2} = 1$ (b) $\lim_{x\to-\infty} \dfrac{\sqrt{1+9x^2}}{4x-2} = -1$

(c) $\lim_{x\to-\infty} \dfrac{\sqrt{1+9x^2}}{4x-2} = \dfrac{3}{4}$ (d) $\lim_{x\to-\infty} \dfrac{\sqrt{1+9x^2}}{4x-2} = 0$

(e) $\lim_{x\to-\infty} \dfrac{\sqrt{1+9x^2}}{4x-2} = -\dfrac{3}{4}$

5 pts 19. _____ Suppose that a and b are distinct real numbers. Which of the following statements is true about the function whose formula is given below?

$$f(t) = \frac{(t-a)^2(t-b)}{(t-a)(t-b)^2}$$

(a) The function f has a removable discontinuity at $x = a$ and at $x = b$.

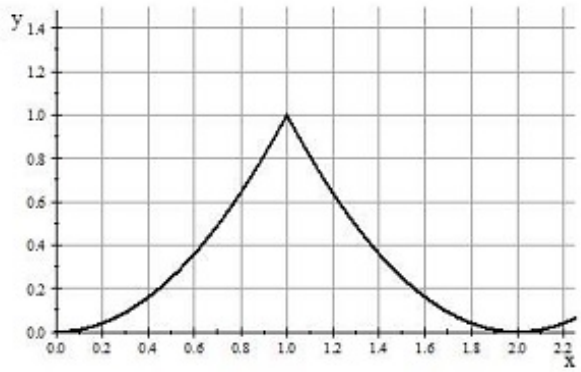
(b) The function f has a removable discontinuity at $x = a$ and a vertical asymptote at $x = b$.

(c) The function f has a vertical asymptote at $x = a$ and a removable discontinuity at $x = b$.

(d) The function f has vertical asymptote at $x = a$ and at $x = b$.

(e) None of the above statements is true.

5 pts 20. _____ Consider the function $y = f(x)$ whose graph is shown along with the statements below the graph.



I. The function f is continuous at the input value $x = 1$.

II. The function f is locally linear at the point $(1, 1)$.

III. The function f is *not* locally linear at the point $(1, 1)$.

(a) Only Statement I is true. (b) Only Statement II is true.

(c) Only Statement III is true. (d) Statements I and II are true.

(e) Statements I and III are true.