Math 175 Applied Calculus

Midterm Exam

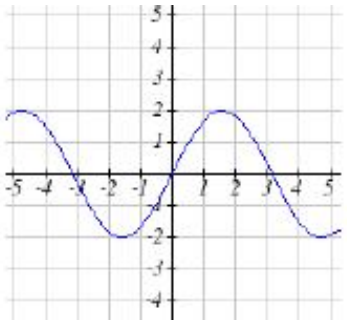
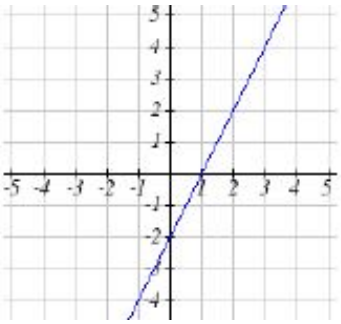
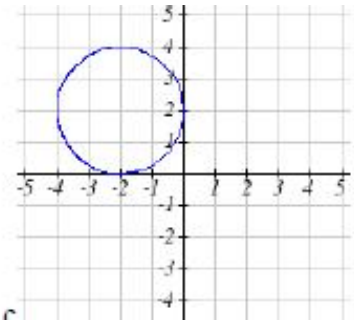
Evans

Name:_____

Directions:

- Please circle the answer you want graded for each problem. Each question is worth 4pts unless otherwise noted.

1. Select all the following graphs which represent y as a function of x.

2. **Suppose:** $h(x) = 4x^3 + 5x^2 - 7$ and $f(x) = 3x - 8$

   (a) Evaluate $f(1)$

   (b) Evaluate $h(0)$

   (c) Evaluate $(h \circ f)(3)$

   (d) Evaluate $f(h(-1))$

3. For the function $f(x) = \dfrac{1}{3x+2}$ Find a formula for f^{-1}

4. Using **INTERVAL NOTATION** find the following for $f(x)$ (the function listed in the previous question)

   (a) Find the Domain of f

   (b) Find the Range of f

   (c) Find the Domain of f^{-1}

   (d) Find the Range of f^{-1}

5. Find the **slope** of the line that contains the points $(2, 3)$ and $(4, -1)$.

6. Find the **equation of the line** that contains the points $(2, -1)$ and $(4, 9)$.

7. Find the **equation of the line** that contains the point $(2, 3)$ and that is parallel to the line containing the points $(7, 1)$ and (5,6).

8. Suppose f is the function defined by:
$f(x) = x^2 + 7x + 12$

   (a) Find the vertex of $f(x)$

   (b) Find the x-intercepts (also known as the zeros) of $f(x)$ if they exist

9. Using $r(x) = \dfrac{3x + 1}{(x + 2)(x - 1)}$ find:

   (a) Any **Vertical Asymptotes** of r

   (b) Any **Horizontal Asymptotes** of r

10. Solve each equation for the variable.

    (a) $\log_b 8 = 3$

    (b) $\log_b 2 = 1/2$

    (c) $e^{5x} = 17$

    (d) $10 - 8\left(\frac{1}{2}\right)^x = 5$

11. Find a number t such that $\ln(2t + 1) = -4$.

    Answer the following questions if you deposited 2,500 dollars into a bank account earning 6.5 percent interest compounded **monthly (PROBLEM SOLVING)**

12. How much money would you have after 10 years?

13. How long would it take for your money to double?

14. How long would it take to accumulate 10,000 dollars?

15. **(Critical Thinking)** A company's profit increased linearly from \$6 million at the end of year 1 to \$14 million at the end of year 3.

    (a) Use the two (year, profit) data points (1,6) and (3,14) to find the linear relationship $y = mx + b$ between x =year and y =profit.

    (b) Find the company's profit at the end of 2 years.

    (c) Predict the company's profit at the end of 5 years

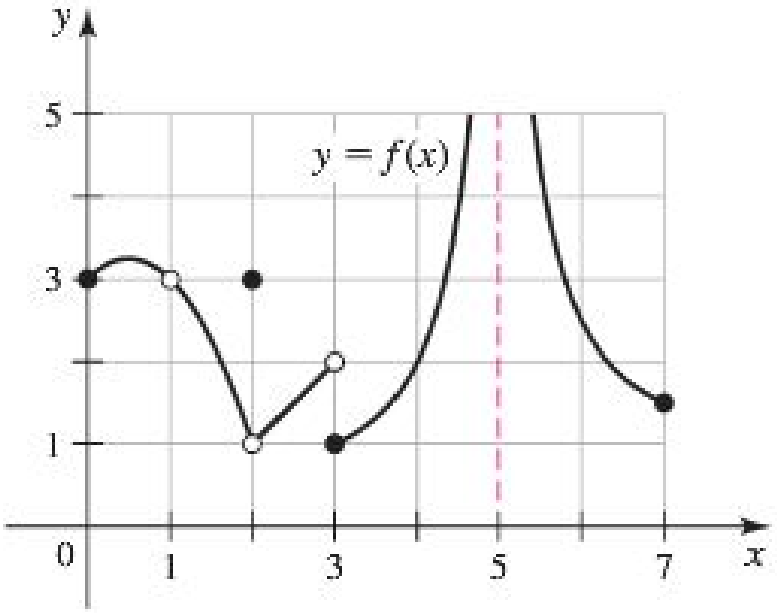
Evaluate the indicated expression

16. $\lim_{x \to 2} 3x + 2x^2$

17. $\lim_{x \to -3} \dfrac{(x^2 + x - 6)}{x + 3}$

18. $\lim_{h \to 0} \dfrac{(2 + h)^2 - 4}{h}$

19. $\lim_{x \to 0} \dfrac{\sqrt{x + 1} - 1}{x}$



Use the graph of f in the figure to find the following values or state they do not exist,

20. $f(3) =$

21. $\lim_{x \to 3^-} f(x) =$

22. $\lim_{x \to 3^+} f(x) =$

23. $\lim_{x \to 3} f(x) =$

24. $f(1) =$

25. $\lim_{x \to 1} f(x) =$

- Please circle the answer you want graded for each problem.

Evaluate the indicated expression

26. State the limit definition of the derivative of a function $f(x)$

27. Given
$$q(x) = x^3 + 2x$$

(a) Use the limit definition of a derivative (difference quotients a.k.a. the 'long way') to find the derivative of $q(x)$...must show work for credit

(b) Find $q'(2)$ (Using any method)

(c) Find the equation of the tangent line to the graph of $q(x)$ at the point $x = 2$

(Aplication) The height of a baseball thrown upward on the surface of the moon is given by $s(t) = 20t - 0.82t^2$ where the height s is measured in meters and the time t is in seconds.

28. Find $s(5)$. What is the practical meaning of your answer? (Writing across the curriculum)

29. What was the **average velocity** of the baseball from 5 to 10 seconds including units? (Evaluation)

30. Find the **instantaneous velocity** of the baseball at 7 seconds including units? (Problem Solving)

31. Given that $s'(20) = -12.8$ what does this expression mean? (Understanding)

32. Find the acceleration of the baseball at 8 seconds including units. (Critical Thinking)

Find the derivative of the following functions using any method.

33. if $y = 3x^2 - 4x^5 + 3^x + \sqrt{x} + \pi$, then dy/dx is:

34. Given that $f(x) = xe^x$, find $f'(x)$

35. if $t = \dfrac{3y}{y^2 + 1}$ what is dt/dy?

36. if $t = \dfrac{y^2}{2y + 1}$ what is dt/dy?

37. if $y = (3x^2 + 4x - 7^x)e^{5x}$, then dy/dx is:

Briefly explain what each tell you about the original ('parent') graph of $f(x)$

38. $f'(x) < 0$ for $-1 < x < 2$ and $x > 6$

39. $f'(x) > 0$ for $x < -1$ and $2 \leq x < 6$

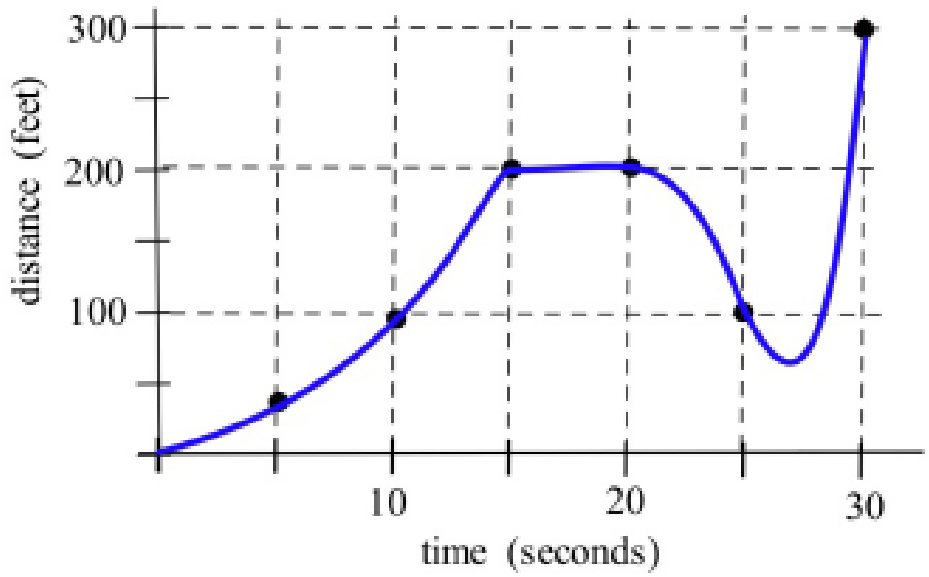
40. $f'(-1) = 0$

41. $f''(x) < 0$ for $x < 0$ and $5 < x < 7$

42. $f''(x) > 0$ for $0 < x < 5$ and $x > 7$

43. $\lim_{x \to 7^-} f(x) = -\infty$ and $\lim_{x \to 7^+} f(x) = +\infty$

44. (Critical Thinking) Draw a sketch of a function meeting all the above conditions.



The Graph shows the distance of a car from measuring position located on the edge of a straight road

45. What was the average velocity of the car from $t = 0$ to $t = 30$ seconds?

46. What was the average velocity of the car from $t = 25$ to $t = 30$ seconds?

47. About how fast was the car traveling at $t = 10$ seconds?

48. About how fast was the car traveling at $t = 20$ seconds?

49. What does the horizontal part of the graph between $t = 15$ and $t = 20$ seconds mean?

50. What does the negative velocity at $t = 25$ seconds represent?

Frederick Community College Policy 4.12 G

FCC Code of Academic Honesty

Frederick Community College is committed to the success of all students.
Academic honesty is an essential component of that success. All members of the college community have the responsibility to uphold the Code of Academic Honesty. As a member of the community, students are expected to use their own efforts, ideas, and materials. Students are also expected to give full credit for borrowing another's work. Work includes, but is not limited to, words, ideas, art, musical compositions, computer programs, dances, creative writing, and research. Students are expected to conform strictly to this code. Violations of the code will result in appropriate disciplinary action.

You may work together on this exam, use your books, and notes.

Show work whenever possible, as the answer alone will not get full credit.
Circle your final answers and Show work, clearly label each problem and be sure write neatly. Read the directions to a problem before you begin. Points will be deducted if the directions are not followed.

Honor code: I have read, understood, and adhered to the directions of this test. All submitted work is authentic, my own, and I am able to replicate it. I am aware that I may be requested to defend any of my provided answers by any means including, but not limited to, oral defense. I have not received unauthorized aid on this exam.

Signed:_____

Date:_____