Test Form D **Name** ______________ **Date** ____________

Chapter P **Class** ______________ **Section** __________

1. Show that $y = \dfrac{x}{x^2 + 1}$ is symmetric with respect to the origin.

2. Find the intercepts: $y = \dfrac{2x - 1}{3 - x}$.

3. Find all points of intersection: $y = -x^2 + 4x$ and $y = x^2$.

4. Find an equation for the straight line that passes through the point $(2, 3)$ and is parallel to the line $x = 4$.

5. Find an equation in general form for the straight line that passes through the point $(-1, 4)$ and is perpendicular to the line $2x + 3y = 6$.

6. If $f(x) = 3 - x^2$, find:

   a. $f(3)$ b. $f(-1)$ c. $f(2 + \Delta x)$

7. If $g(x) = x^2 + 3x - 1$, find $\dfrac{g(x + \Delta x) - g(x)}{\Delta x}$.

8. If $f(x) = \dfrac{1}{\sqrt{x}}$ and $g(x) = x^2 - 5$, find $g(f(x))$.

9. Find the domain: $f(x) = \dfrac{1}{x^2 - 2x - 2}$.

10. Sketch a graph of $y = x^3 - 1$.

11. Sketch the graph of the equation $4x - 2y + 8 = 0$.

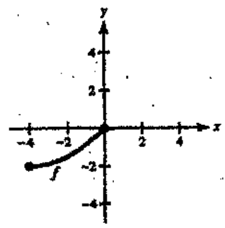
12. In which of the following equations is y a function of x?

    a. $3x + 2y - 7 = 0$ b. $5x^2y = 9 - 2x$ c. $3x^2 - 4y^2 = 9$

    d. $x = 3y^2 - 1$ e. None of these

13. Given $f(x) = 3x - 7$, find $f(x + 1) + f(2)$.

14. The domain of the function f shown in the figure is $-4 \leq x \leq 4$. Complete the graph of f if f is odd.



15. Use the graph of $f(x) = |x|$ to sketch the graph of $y = |x - 1| + 3$.

16. Find the slope and y-intercept of the line given by the equation $5x + 4y - 12 = 0$.

17. Let $f(x) = \begin{cases} x^2 - 4, & x < 2 \\ 3 - 2x, & x \geq 2 \end{cases}$. Evaluate:

a. $f(0)$ b. $f(2)$ c. $f(3)$

18. A student working for a telemarket company gets paid \$3 per hour plus \$1.50 for each sale. Let x represent the number of sales the student has in an 8-hour day.

a. Write a linear equation giving the day's salary S in terms of x.

b. Use the linear equation to calculate the student's salary on Wednesday if the student makes 14 sales that day.

c. Use the linear equation to calculate the number of sales per day the student would have to make in order to earn at least \$100 a day.

Test Form D **Name** ______________ **Date** __________

Chapter 1 **Class** ______________ **Section** __________

1. Calculate $\lim_{x \to 2} (2x^2 - 6x + 1)$.

2. If $\lim_{x \to 3} (3x - 2) = 7$, find δ such that $|(3x - 2) - 7| < 0.003$ whenever $0 < |x - 3| < \delta$.

3. Find the limit: $\lim_{x \to 1} f(x)$ if $f(x) = \begin{cases} x^2 + 4, & x \neq 1 \\ 2, & x = 1 \end{cases}$.

4. Find the limit: $\lim_{x \to -1} \dfrac{x^2 + 3x + 2}{x^2 + 1}$.

5. Find the limit: $\lim_{x \to 2} \sqrt{4x^2 + 9}$.

6. If $\lim_{x \to c} f(x) = -\frac{1}{2}$ and $\lim_{x \to c} g(x) = \frac{2}{3}$, find $\lim_{x \to c} [f(x) - g(x)]$.

7. Find the limit: $\lim_{x \to -2} \dfrac{x + 2}{x^3 + 8}$.

8. Find the limit: $\lim_{\Delta x \to 0} \dfrac{\sqrt{x + \Delta x} - \sqrt{x}}{\Delta x}$.

9. Find the limit: $\lim_{x \to 1} \dfrac{x - 1}{|x - 1|}$.

10. Find the limit: $\lim_{x \to 5} \cot \dfrac{\pi x}{6}$.

11. Find the limit: $\lim_{x \to 0} \dfrac{x}{\sin 3x}$.

12. Find the limit: $\lim_{x \to 2^+} \sqrt{2x - 1}$.

13. Find the limit: $\lim_{x \to -1^-} \dfrac{1}{x + 1}$.

14. Find the limit: $\lim_{x \to 3} \dfrac{3}{x^2 - 6x + 9}$.

15. Find the limit: $\lim_{x \to 0}\left(3x + 2 + \frac{1}{x^2}\right)$.

16. Find the value(s) of x for which $f(x) = \frac{x-2}{x^2-4}$ is discontinuous and label these discontinuities as removable or nonremovable.

17. Let $f(x) = \frac{5}{x-1}$ and $g(x) = x^4$.

a. Find $f(g(x))$.

b. Find all values of x for which $f(g(x))$ is discontinuous.

18. Determine the value of c so that $f(x)$ is continuous on the entire real line if $f(x) = \begin{cases} x^2, & x \le 3 \\ \frac{c}{x}, & x > 3 \end{cases}$.

19. Find all vertical asymptote(s) of $f(x)$ if $f(x) = \frac{x^2 + 3x - 1}{x + 7}$.

20. Find all vertical asymptote(s) of $f(x)$ if $f(x) = \frac{2x - 2}{(x-1)(x^2 + x - 1)}$.

Test Form D **Name** ______________ **Date** __________

Chapter 2 **Class** ______________ **Section** __________

1. Use the definition of a derivative to find the derivative of $f(x) = \frac{1}{x}$.

2. Differentiate: $y = \frac{2x}{1 - 3x^2}$.

3. Find $\frac{dy}{dx}$ for $y = (x^3)\sqrt{2x + 1}$.

4. Find $f'(x)$ for $f(x) = \cot^3\sqrt{x}$.

5. Calculate $\frac{d^2y}{dx^2}$ for $y = \frac{1 - x}{2 - x}$.

6. The position equation for the movement of a particle is given by $s = (t^3 + 1)^2$ where s is measured in feet and t is measured in seconds. Find the acceleration of this particle at one second.

7. Find y' if $y = \frac{x}{x + y}$.

8. Find $\frac{dy}{dx}$ if $x = \cos y$.

9. Find the derivative: $f(\theta) = \sec \theta^2$.

10. Differentiate and simplify: $y = \sin^2 x - \cos^2 x$.

11. Find an equation for the tangent line to the graph of $f(x) = \sqrt{x + 1}$ at the point where $x = 3$.

12. Find the values of x for all points on the graph of $f(x) = x^3 - 2x^2 + 5x - 16$ at which the slope of the tangent line is 4.

13. Find the instantaneous rate of change of R with respect to x if $R = 2x^2 + \frac{1}{x}$.

14. An object is thrown (straight down) from the top of a 220-foot building with an initial velocity of 26 feet per second.

    a. Write the position equation for the movement described.

    b. What is the velocity at one second?

15. As a balloon in the shape of a sphere is being blown up, the volume is increasing at the rate of 4 cubic inches per second. At what rate is the radius increasing when the radius is 1 inch?

16. Analytically show that the graph of the function $f(x) = x^3 + 2x^2 + 6x$ does not have a tangent line with a slope of 4.

Test Form D **Name** ______________ **Date** ______________

Chapter 3 **Class** ______________ **Section** ______________

1. Find the function f that has the derivative $f'(x) = 4x + 1$ and whose graph passes through the point $(1, 0)$.

2. Determine the intervals where f is increasing or decreasing for $f(x) = \frac{1}{x^2}$.

3. Find all critical numbers: $f(x) = x\sqrt{2x + 1}$.

4. Find extrema: $y = \frac{2x}{(x + 4)^3}$.

5. Find all extrema in the interval $[0, 2\pi]$ if $y = \sin x + \cos x$.

6. Find all intervals for which the graph of the function $y = 8x^3 - 2x^4$ is concave downward.

7. Let $f(x) = x^3 - x^2 + 3$. Use the Second Derivative Test to determine which critical numbers, if any, give relative extrema.

8. Find the limit: $\lim_{x \to \infty} \frac{\sqrt{4x^2 - 1}}{x}$.

9. Use the techniques learned in this chapter to sketch the graph of $y = \frac{3}{(1 - x)^2}$.

10. Use the techniques learned in this chapter to sketch the graph of $y = x^3 - 3x + 1$.

11. Find all points of inflection for the graph of the function $f(x) = 2x(x - 4)^3$.

12. The management of a large store has 1600 feet of fencing to fence in a rectangular storage yard using the building as one side of the yard. If the fencing is used for the remaining 3 sides, find the area of the largest possible yard.

13. Calculate 3 iterations of Newton's Method to approximate a zero of $f(x) = x^3 - x + 1$. Use $x_1 = -1.5000$ as the initial guess and round to 4 decimal places after each iteration.

14. Find all horizontal asymptotes: $f(x) = \frac{2}{x - 3} - \frac{x}{x + 2}$.

15. ~~The volume of a cube is claimed to be 27 cubic inches, correct to within 0.027 cubic inches. Use differentials to estimate the propagated error in the measurement of the side of the cube.~~

Test Form D **Name** ______________ **Date** __________

Chapter 4 **Class** ______________ **Section** __________

1. Evaluate the integral: $\int \sqrt{x^3}\,dx$.

2. Evaluate the integral: $\int 3 \csc x \cot x\,dx$.

3. Evaluate the integral: $\int \frac{x^3 - x^2}{x^2}\,dx$.

4. Evaluate the integral: $\int \frac{\cos^3 \theta}{2 - 2\sin^2 \theta}\,d\theta$.

5. Find the function, $y = f(x)$, if $f'(x) = 2x - 1$ and $f(1) = 3$.

6. Use $a(t) = -32$ feet per second squared as the acceleration due to gravity. An object is thrown vertically downward from the top of a 480-foot building with an initial velocity of 64 feet per second. With what velocity does the object hit the ground?

~~7. Let $s(n) = \sum_{i=1}^{n}\left(1 + \frac{2i}{n}\right)\left(\frac{2}{n}\right)$. Find the limit of $s(n)$ as $n \to \infty$.~~

8. Write the definite integral that represents the area of the region enclosed by $y = 4x - x^2$ and the x-axis.

9. Evaluate: $\frac{d}{dx}\int_2^x (2t^2 + 5)^2\,dt$.

10. Use the Fundamental Theorem of Calculus to evaluate $\int_{-1}^{1} \left(\sqrt[3]{t} - 2\right) dt$.

11. Find the average value of $f(x) = \sin x$ on the interval $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$.

12. Evaluate the integral: $\int_0^1 x\sqrt{1 - x^2}\,dx$.

13. Evaluate the integral: $\int \frac{\sec^2 x}{\sqrt{\tan x}}\,dx$.

14. Evaluate the integral: $\int_0^3 |x - 2|\,dx$.

15. Evaluate the indefinite integral: $\int \frac{x}{\sqrt{x-1}}\,dx$.

16. ~~Use Simpson's Rule with $n = 4$ to approximate $\int_1^2 \frac{1}{(x+1)^2}\,dx$.~~

Test Form D CHAPTER 4

1. $\frac{2}{5}x^{5/2} + C$ 2. $-3 \csc x + C$

3. $\frac{x^2}{2} - x + C$ 4. $\frac{1}{2}\sin \theta + C$

5. $y = x^2 - x + 3$ 6. -186.6 ft/s 7. 4

8. $\int_0^4 (4x - x^2)\,dx$ 9. $(2x^2 + 5)^2$ 10. -4

11. $\frac{2\sqrt{2}}{\pi}$ 12. $\frac{1}{3}$ 13. $2\sqrt{\tan x} + C$ 14. $\frac{5}{2}$

15. $\frac{2}{3}\sqrt{x-1}(x+2) + C$ 16. 0.1667

Test Form D CHAPTER P

1. $f(-x) = \dfrac{-x}{(-x)^2 + 1} = -\dfrac{x}{x^2 + 1} = -f(x)$

2. $\left(0, -\frac{1}{3}\right), \left(\frac{1}{2}, 0\right)$ 3. $(0, 0), (2, 4)$

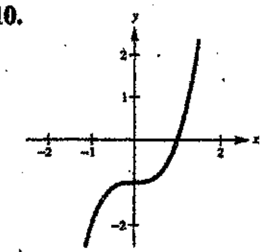
4. $x = 2$ 5. $3x - 2y + 11 = 0$

6. a. -6 b. 2 c. $-1 - 4\Delta x - (\Delta x)^2$

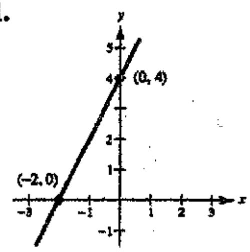
7. $2x + \Delta x + 3$ 8. $\dfrac{1}{x} - 5$

9. All reals except $1 \pm \sqrt{3}$

10.

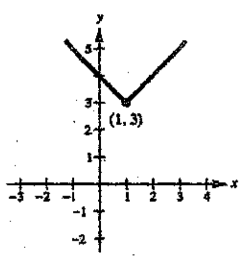


11.



12. a and b 13. $3x - 5$ 14. Neither

15.



16. Slope: $-\frac{5}{4}$, y-intercept $(0, 3)$

17. a. -4 b. -1 c. -3

18. a. $S = 24 + 1.50x$ b. $45.00 c. 51

Test Form D CHAPTER 1

1. -3 2. 0.001 3. 5 4. 0 5. 5

6. $-\dfrac{7}{6}$ 7. $\dfrac{1}{12}$ 8. $\dfrac{1}{2\sqrt{x}}$ 9. Does not exist

10. $-\sqrt{3}$ 11. $\frac{1}{3}$ 12. $\sqrt{3}$ 13. $-\infty$

14. $+\infty$ 15. ∞

16. $x = 2$, removable; $x = -2$, nonremovable

17. a. $\dfrac{5}{x^4 - 1}$ b. $-1, 1$ 18. 27 19. $x = -7$

20. $x = \dfrac{-1 - \sqrt{5}}{2}, x = \dfrac{-1 + \sqrt{5}}{2}$

Test Form D CHAPTER 2

1. $-\dfrac{1}{x^2}$ 2. $\dfrac{6x^2 + 2}{(1 - 3x^2)^2}$ 3. $\dfrac{x^2(7x + 3)}{\sqrt{2x + 1}}$

4. $\dfrac{-3\cot^2\sqrt{x}\left(\csc^2\sqrt{x}\right)}{2\sqrt{x}}$ 5. $\dfrac{-2}{(2 - x)^3}$

6. 42 ft/sec^2 7. $\dfrac{y}{(x + y)^2 + x}$ 8. $-\csc y$

9. $2\theta \sec \theta^2 \tan \theta^2$ 10. $2 \sin 2x$

11. $x - 4y = -5$ 12. $\dfrac{1}{3}, 1$ 13. $4x - \dfrac{1}{x^2}$

14. a. $s = -16t^2 - 26t + 220$ b. -58 ft/sec

15. $\dfrac{1}{\pi}$ in/sec

16. $f'(x) = 3x^2 + 4x + 6 = 4$

$3x^2 + 4x + 2$ has no real zeros.

Test Form D CHAPTER 3

1. $f(x) = 2x^2 + x - 3$

2. Increasing $(-\infty, 0)$; Decreasing $(0, \infty)$

3. $-\frac{1}{3}, -\frac{1}{2}$ 4. $\left(2, \frac{1}{54}\right)$, relative maximum

5. Relative maximum: $\left(\dfrac{\pi}{4}, \sqrt{2}\right)$

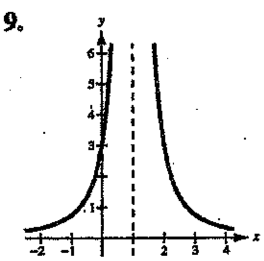
Relative minimum: $\left(\dfrac{5\pi}{4}, -\sqrt{2}\right)$

6. $(-\infty, 0)$ and $(2, \infty)$

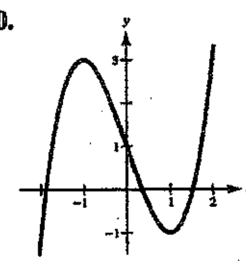
7. $x = 0$, relative maximum; $x = \frac{2}{3}$, relative minimum

8. 2

9.



10.



11. $(4, 0), (2, -32)$ 12. 320,000 sq ft

13. -1.3247 14. $y = -1$ 15. ± 0.001 in.