

171 FINAL DECEMBER 20, 2002

NAME: _____

T.A.: _____

INSTRUCTIONS: Show all your work. Answers alone will receive little or no credit. Be neat. We do not want to be required to guess at what you're doing. We must be able to see how you got to your answer. **Take your time and be careful with your calculations. A mistake early in your work could be costly.**

1. _____

8. _____

2. _____

9. _____

3. _____

10. _____

4. _____

11. _____

5. _____

12. _____

6. _____

7. _____

TOTAL _____

1. (15 p'ts.) Let $f(x) = x^2 - 9$ and $g(x) = \sqrt{x-1}$. Find $(f \circ g)(x)$ and $(g \circ f)(x)$ and specify their domains.

Ans. $(f \circ g)(x) = \underline{\hspace{10em}}$, $\text{Dom}(f \circ g)(x) = \underline{\hspace{10em}}$

$(g \circ f)(x) = \underline{\hspace{10em}}$, $\text{Dom}(g \circ f)(x) = \underline{\hspace{10em}}$

2. (15 p'ts.) Solve for x . $\frac{x-2}{3x+4} \leq 4$.

Ans. _____

3. (10 p'ts.) Is the function

$$f(t) = \begin{cases} \frac{t^3-27}{t-3} & t \neq 3 \\ 21 & t = 3 \end{cases}$$

continuous at $t = 3$? Justify your answer.

Ans. _____

4. (15 p'ts.) Find the limit

$$\lim_{x \rightarrow \infty} \frac{3\sqrt{x^3} + 5x}{\sqrt{2x^3}}$$

Ans. _____

5. (20 p'ts.) a) $y = \frac{2x^2 - x + 2}{x^2 + 1} 4$. Find dy/dx .

Ans. _____

b) Suppose $f'(x) = 3x$ and put $F(x) = f(x^2 + 3x)$. Find $F'(-1)$.

Ans. _____

6. (15 p'ts.) Find the equation of the line tangent to the curve $x^{2/3} - y^{2/3} - 2y = 2$ at the point $(1, -1)$.

Ans. _____

7. (10 p'ts.) Find the exact value of $\cos(\pi/12)$.

Ans. _____

8. (20 p'ts.) Find the exact value of $\sin(2 \tan^{-1}(-5/12))$.

Ans. _____

9. (20 p'ts.) Consider the triangle with $\gamma = 45^\circ$, $b = 10.0$ and $a = 15.0$. Find the three remaining parts of the triangle. Justify your answer.

Ans. $\alpha =$ _____, $\beta =$ _____, $c =$ _____

10. (20 p'ts.) John is 6 feet tall. He is walking away from a street light which is 30 feet high. He walks at a rate of 2 feet per second. How fast is John's shadow increasing in length when John is 24 feet from the pole?

Ans. _____

11. (20 p'ts.) At 7:00 A.M., one ship was 60 miles due east from a second ship. If the first ship sailed west at 20 miles per hour and the second ship sailed southeast at 30 miles per hour, at what time were they closest together? Justify your answer.

Ans. _____

12. (20 p'ts.) Find the maximum and minimum values of $f(x) = \sin(x) + \cos(2x)$. on the interval $[0, \pi]$. Where do these values occur?

Ans. Max = _____, at x = _____

Ans. Min = _____, at x = _____

