NAME: _____ REVIEW #8
MIXED
DATE: _____ JCC MAT 171

1 – 6 Find the limits.

1. $\lim\limits_{x\to 1}\dfrac{x^2+x-2}{x-1}$

2. $\lim\limits_{x\to\infty}\dfrac{2x^3+6x^2+5}{3+x^3}$

3. $\lim\limits_{\Delta x\to 0}\dfrac{(x+\Delta x)^2-2(x+\Delta x)-(x^2-2x)}{\Delta x}$

4. $\lim\limits_{t\to 1}\dfrac{\sqrt{t}-1}{t-1}$

5. $\lim\limits_{x\to 0}\dfrac{\ln(2x^2+1)}{x}$

6. $\lim\limits_{x\to 2}\dfrac{\frac{1}{2}-\frac{1}{x}}{x-2}$

7. Determine the value of c so that $f(x)$ is continuous on the entire real line if

$$f(x)=\begin{cases} x^2, & x\le 3 \\ \frac{c}{x}, & x>3 \end{cases}$$

8. Find the point(s) on the graph of $y=\dfrac{1}{x}$ where the graph is parallel to the line $4x+9y=3$.

9. Given the function: $f(x)=\dfrac{2x^2+5}{x^2+x-2}$
   a. At least one vertical asymptote exists in the graph of the given function. Verify this algebraically showing all work.
   b. At least one horizontal asymptote exists in the graph of the given function. Verify this algebraically showing all work.

10. Use implicit differentiation to find $\dfrac{dy}{dx}$ for $x^2+xy+y^2=5$

11 – 15 Differentiate. (Do not simplify)

11. $y=\sin^2 x+\cos^2 x$

12. $f(x)=\ln(x^3+3x)^3$

13. $y=e^{\frac{1}{x}}$

14. $y=\ln(x^2+3)$

15. $y=\dfrac{7x+2}{(x^2-5)^3}$

16. Let $f(x) = x^4 - 4x^3 + 4x^2 + 1$.
    a. Find all critical numbers of *f*.
    b. Find the intervals over which *f* is increasing or decreasing.
    c. Locate relative extrema using the first derivative test.

17 – 21 Find the antiderivative of each of the following.

17. $\int \frac{x^3 + 5x - 7}{x} dx$

18. $\int \frac{e^{2x}}{1 + e^{2x}} dx$

19. $\int x\sqrt{6x^2 + 5}dx$

20. $\int \cos(2x - 3)dx$

21. $\int \sin^3 3x \cos 3x dx$

22. A rancher with 10,000 meters of available fencing intends to enclose a rectangular field adjacent to a straight river. If the side along the river requires no fencing, find the dimensions of the field with largest possible area.

23. As a cylindrical water tank of diameter 40 feet is draining, the level of the water decreases at a constant rate of 3/2 ft per minute. How fast is the volume of water in the tank decreasing?