MAT 108 Final Exam Review G.Buthusiem

1. Find the limit.

   $\lim_{x\to -3} x^2+3x$

2. Find the limit (if it exists):

   $\lim_{x\to -15} \dfrac{-x-15}{x^2-225}$

3. Find the limit (if it exists).

   $\lim_{x\to 49^-} \dfrac{\sqrt{x}-7}{x-49}$

4. Find the limit.

   $\lim_{x\to 11^+} \dfrac{x+4}{-x+11}$

5. Find the slope *m* of the line tangent to the graph of the function $f(x)=4-5x$ at the point $(-1,9)$.

6. Find the derivative of the following function using the limiting process.

   $f(x)=-2x^3+9x^2-9$

7. Find an equation of the tangent line to the graph of the function $f(x)=x^2+6x+6$ at the point $(-4,-2)$.

8. Find the derivative of the algebraic function $f(x)=x\left(2-\dfrac{6}{x+9}\right)$.

9. Find the derivative of the function $f(x)=11\sqrt{x}\sin(x)$.

10. Find the derivative of the function $\dfrac{\sin x}{8x+\cos x}$. Simplify your answer.

11. Find the second derivative of the function $f(v)=\dfrac{4v^2+5v-4}{v}$.

12. Find the derivative of the function.

    $g(x)=\left(\dfrac{x+6}{x^2+6}\right)^4$

13. Find the derivative of the function $y=-8\sin 3x$.

14. Find *dy/dx* by implicit differentiation.

    $x^7+7x+10xy-y^3=4$

15. Find the relative extremum of $f(x)=-8x^2+48x+6$ by applying the First Derivative Test.

16. Determine the open intervals on which the graph of the function $y=2x-\tan 3x$, $\left(-\dfrac{\pi}{6},\dfrac{\pi}{6}\right)$ is concave upward or concave downward.

17. Find the limit.

$$\lim_{x\to\infty}\frac{4x-6}{-7x^2-5}$$

18. Find the indefinite integral and check the result by differentiation.

$$\int \frac{5u^2+6u-12}{u^4}\,du$$

19. Find the indefinite integral $\int z^2\sqrt{\left(2+z^3\right)}\,dz$.

20. Find the indefinite integral of the following function and check the result by differentiation.

$$\int\frac{5t^4}{\sqrt{t^5+1}}\,dt$$

21. Use implicit differentiation to find $\frac{dy}{dx}$.

$$x^3+7\ln y=8$$

22. Use logarithmic differentiation to find $\frac{dy}{dx}$.

$$y=\frac{3x-2}{(5x+2)^4}$$

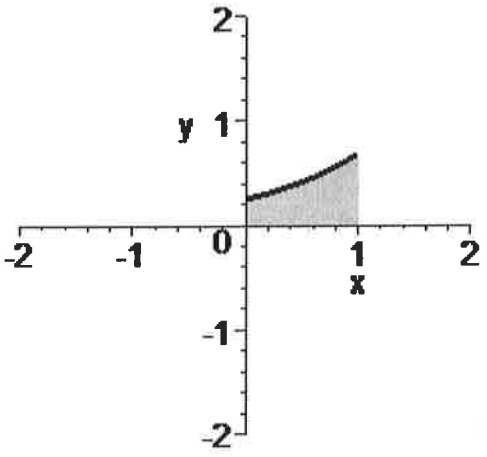
23. Evaluate the definite integral.

$$\int_1^3 \frac{1-\cos(11\theta)}{11\theta-\sin(11\theta)}\,d\theta$$

24. Find the derivative of the function $f(x)=x^5e^x$.

25. Find the area of the shaded region.

$$y=\frac{1}{4}e^x$$



Answer Key

1. 0
2. $\frac{1}{30}$
3. $\frac{1}{14}$
4. $-\infty$
5. $m=-5$
6. $f'(x)=-6x^2+18x$
7. $y=-2x-10$
8. $f'(x)=\frac{108+36x+2x^2}{(x+9)^2}$
9. $\frac{11}{2\sqrt{x}}\sin(x)+11\sqrt{x}\cos(x)$
10. $\frac{1+8x\cos x-8\sin x}{(8x+\cos x)^2}$
11. $f''(v)=-\frac{8}{v^3}$
12. $g'(x)=\frac{4(6-12x-x^2)(6+x)^3}{(6+x^2)^5}$
13. $y'=-24\cos 3x$
14. $\frac{dy}{dx}=\frac{7x^6+7+10y}{3y^2-10x}$
15. relative maximum: $(3,78)$
16. concave upward: $\left(-\frac{\pi}{6},0\right)$; concave downward: $\left(0,\frac{\pi}{6}\right)$
17. 0
18. $-\frac{5}{u}-\frac{3}{u^2}+\frac{4}{u^3}+C$
19. $\frac{2(2+z^3)^{\frac{3}{2}}}{9}+C$
20. $2\sqrt{t^5+1}+C$
21. $-\frac{3x^2y}{7}$
22. $\frac{-45x+46}{(5x+2)^5}$
23. $\frac{1}{11}\ln\left|\frac{33-\sin(33)}{11-\sin(11)}\right|$
24. $x^4e^x(x+5)$
25. $\frac{e-1}{4}$