Calc 1 Final Exam Review G. Buthusiem

1. Find the limit of the following if they exist

   a. $\lim_{x\to -2}\dfrac{x+2}{x^2-4}$ b. $\lim_{x\to 4}\dfrac{\sqrt{x-3}-1}{x-4}$ c. $\lim_{x\to 3^-}\dfrac{1}{x-3}$ d. $\lim_{x\to\infty}\dfrac{15x^3-2x+3x+1}{5-x+x^2-3x^3}$

2. Use the limit definition to find the derivative of $y=x^2-x-1$

3. Find the line tangent to the curve $y=\sec^2 5x$ at $x=\dfrac{\pi}{4}$.

4. Find the equation of the line tangent to the curve $f(x)=x(x^2+3x-1)$ at (1,3).

5. Find the second derivative of $y=\dfrac{1}{x^2+5}$.

6. Find the derivative of the following:

   a. $y=5-\tan x+x^2\sin x$ b. $f(x)=\dfrac{x^2}{x^3+x-1}$ c. $y=\dfrac{e^x-e^{-x}}{2}$

7. Use implicit differentiation to find $\dfrac{dy}{dx}$ for $x^3+5x-6xy+y^2=1$.

8. Evaluate the following integrals

   a. $\int\dfrac{x^5-5x^2+1}{x}dx$ b. $\int 2x\sec x^2\tan x^2 dx$ c. $\int_{\frac{\pi}{3}}^{\pi}\cos x dx$ d. $\int_0^{\frac{\pi}{2}}\cos^2 x\sin x dx$

   e. $\int\dfrac{\ln x}{x}dx$ f. $\int x^3\sqrt{x^4+2}dx$ g. $\int\dfrac{x}{\sqrt{2x-1}}dx$

9. Find the velocity and acceleration of the object with position function $s(t)=t^2-2t+3$.

10. Find the relative extrema for $f(x)=x^3-6x^2+15$.