微 積 分　　期 中 考

1. Find the **absolute** extrema of the function on the closed interval. (10%)

(a) $f(x)=\frac{1}{4}x^4-\frac{1}{3}x^3,\ [-1,2]$　　(b) $y=\tan\left(\frac{\pi x}{8}\right),\ [0,2]$

2. Find the open interval(s) on which the function is increasing or decreasing, and to identify all **relative** extrema. (20%)

(a) $f(x)=x^2-4x$　　(b) $f(x)=(x-3)^{1/3}$

(c) $f(x)=\frac{x^2-2x+1}{x+1}$　　(d) $f(x)=\frac{\sin x}{1+\cos^2 x},\ (0,2\pi)$

3. Find the points of inflection and discuss the concavity of the graph of the function. (10%)

(a) $f(x)=(x-2)^3(x-1)$　　(b) $f(x)=2\sin x+\sin 2x,\ [0,2\pi]$

4. Find all relative extrema. Use the Second Derivative Test where applicable. (10%)

(a) $f(x)=\sqrt{x^2+1}$　　(b) $f(x)=2\sin x+\cos 2x,\ [0,\pi]$

5. Analyze and sketch a graph of the function. Label any intercepts, relative extrema, points of inflection, and asymptotes. (20%)

$$y=\frac{1}{x-2}-3$$

Find the derivative $\frac{dy}{dx}$ or f'. (30%)

6. $y=2x^3+6x^2-1$　　7. $y=\frac{1-\sin x}{\cos x}$　　8. $f(t)=\left(\frac{t^2}{t^3+2}\right)^2$

9. $y=\sin(\tan 2x)$　　10. $x^3-3x^2y+2xy^2=12$　　11. $\cot y=x-y$