1. Evaluate the limits

$(i)\ \lim_{x \to -2} \frac{x^3+5x^2+8x+4}{x^3+3x^2-4}$

$(ii)\ \lim_{x \to \infty} \left(e^x+x\right)^{\frac{2}{x}}$

2. Find the area of the region enclosed by the graphs of $y = x^2$ and $y = x+6$

3. A rectangular field is to be fenced in using two kinds of fencing. Two opposite sides will use heavy duty fencing which costs \$3 per foot but the remaining two sides will use standard fencing that only costs \$2 per foot. Whatr are the dimensions of the rectangular plot of greatest area that can be fenced in at a cost of \$6000 ?

4. For $y = f(x) = x^4 - 2x^2 - 12$:

(i) Find all local max and local min

(ii) Find all points of inflection

(iii) Make a nice sketch of the graph

5. Evaluate $\int_0^8 (6x+1)\,dx$ by using the formula $\int_0^b f(x)\,dx = \lim_{n\to\infty}\left[\sum_{k=1}^{n} f\left(\frac{kb}{n}\right)\left(\frac{b}{n}\right)\right]$.

Do not use the Fundamental Theorem

6. (*i*) If $f(x)=\int_0^x \cos(t^2)\,dt$ then $f'(x)=?$

(*ii*) If $f(x)=\int_0^{x^6} \cos(t^2)\,dt$ then $f'(x)=?$

7. Compute the definite and indefinite integrals. Use any method that works

$(i)\quad \int_1^2 \left(\frac{1}{x^2}+2x\right) dx$

$(ii)\quad \int \frac{(\ln x)^2}{x}\, dx$

$(iii)\quad \int x\sqrt{x+2}\, dx$

8. $y=f(x)=\dfrac{x^2-1}{x^3}$

(i) Find the vertical asymptotes (if any)

(ii) Find the horizontal asymptotes (if any)

(iii) Find (both corrdinates of) the local maxima (if any)

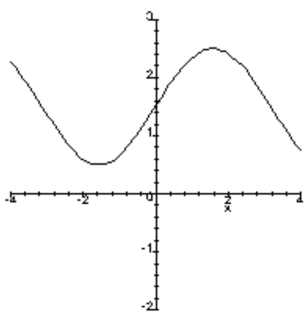
(iv) Find the (both corrdinates of) local minima (if any)

(v) Sketch the graph as well as possible from this information

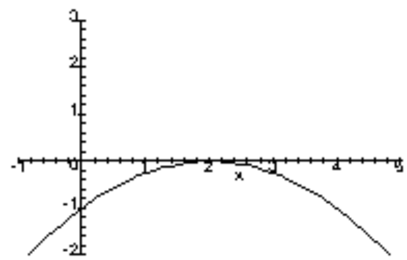
(vi) How many inflection pointrs must there be? (Don't compute them)

9. Here are the graphs of the **derivatives** $f'(x)$ and $g'(x)$ of two functions. Answer each true false question and include a **very** brief explanation . All statements apply only to the interval over which the graph is shown.

$f'(x)$



$g'(x)$



$a)$ $f(x)$ has a point of inflection at x=0 T F

$b)$ $g(x)$ is always concave down T F

$c)$ $f(x)$ has no local max and no local min T F

$d)$ $f''(x)$ has no local max and no local min T F

$e)$ $g(x)$ has a local minimum at x=2 T F