(資工系資工組二年級)

1. Determine the value of the following limits.

   (a). $\lim_{x\to 0}\frac{x}{|x|}$ (7%)

   (b) $\lim_{x\to 0}\frac{\sin 2x}{x}$ (8%)

2. Find the derivative of each function.

   (a) $f(x)=x^5\cos x$. (8%)

   (b) $f(x)=e^{2x}$. (7%)

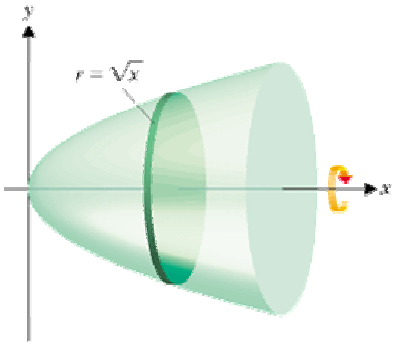
3. Evaluate

   (a) $\int(3\cos x+4x^8)dx$ (7%)

   (b) $\int x\sin x dx$ (8%)

4. Find the equation of tangent line to $x^2+4y^2=8$ at x=2. (10%)

5. Revolve the region under the curve $y=\sqrt{x}$ on the interval [0,4] about the x - axis and find the volume of the resulting solid of revolution (see the following figure). (15%)



6. Find the Taylor series expansion for $f(x)=e^x$ about x=0. (15%)

7. Evaluate $\int\frac{x-19}{x^2-3x-10}dx$ (15%)

(資工系軟體組二年級)

1. Determine the following limits.

   (a). $\lim_{x\to -3}\dfrac{3x+9}{x^2-9}$ (7%)

   (b) $\lim_{x\to 0}\dfrac{\sin x}{2x}$ (8%)

2. Find the derivative of each function.

   (a) $f(x)=x^3\sin x$. (7%)

   (b) $f(x)=\ln(2x), x>0$. (8%)

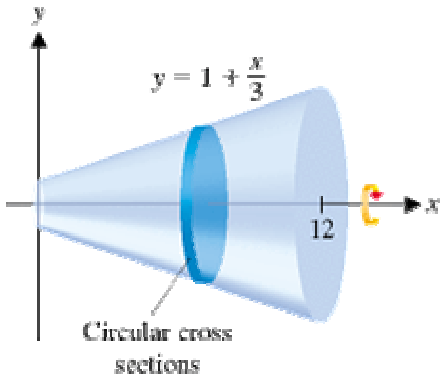
3. Evaluate

   (a) $\int 8\sec^2 x dx$ (7%)

   (b) $\int x\cos x dx$ (8%)

4. Find the equation of tangent line to $4x^2+y^2=8$ at x=1. (10%)

5. Suppose that the line segment y = 1+x/3, 0 ≤ x ≤ 12, is revolved about the x - axis. The resulting solid looks like a megaphone (see the following figure). Compute the volume of this solid. (15%)



6. Find the Taylor series expansion for $f(x)=e^x$ about x=0. (15%)

7. Evaluate $\int \dfrac{1}{x^2+x-2}dx$ (15%)

1. Determine whether $f(x)=\dfrac{x+2}{x^2-4}$ is continuous at $x=2$ and $x=-2$. (10%)

2. Use the equation $m_{\tan}=\lim\limits_{h\to 0}\dfrac{f(a+h)-f(a)}{h}$ to find the equation of the tangent line to the graph of $y=\sin x$ at $x=\dfrac{\pi}{3}$. (10%)

3. Given the relation $\sin y\cos x=x-y$, compute $\dfrac{dy}{dx}$. (10%)

4. $\begin{cases} x=1+e^{-t} \\ y=e^{t} \end{cases}$, find $\dfrac{dy}{dx}$ at $t=\ln 2$. (10%)

5. Let $f(x)=\sin x+\cos x$ on $[0,2\pi]$,
   a) find all inflection points. (5%)
   b) find all local maximum and minimum points. (5%)

6. Let $f_i(x)=e^x, i=1,2,...,n$, let $y=f_1\left(f_2\left(f_3\left(...f_n(x)...\right)\right)\right)$, find $\dfrac{dy}{dx}$. (8%)

7. Evaluate

   (a) $\int \cos x dx$ (7%)

   (b) $\int e^{2x}dx$ (10%)

8. (Integration by Parts) Evaluate $\int xe^x dx$。 (10%)

9. Find the area bounded by the graphs of $y = 3-x$ and $y = x^2-9$ (see the following figure). ◦ (15%)