MATH 181, Exam II

(40) **1.** Compute the following integrals.

a) $\displaystyle\int \frac{2x+7}{x^2-3x-4}\,dx$ (Partial fractions: $x^2-3x-4=(x+1)(x-4)$)

b) $\displaystyle\int \frac{2x+7}{x^2-2x+5}\,dx$ (Complete the square: $x^2-2x+5=(x-1)^2+4$)

c) $\displaystyle\int 2x\ln(x+2)\,dx$ (Integration by parts)

d) Use the methof of Trigonometric Substitution to reduce $\displaystyle\int \frac{(4-x^2)^{3/2}}{x^6}\,dx$ to an integral involving trigonometric functions. Do not compute the trigonometric integral.

(20) **2.** Find the solution to

$$\frac{dy}{dx} = 2x\sqrt{y^2+1}$$

that satisfies the initial condition $y(0)=0$.

(20) **3.** Compute the limits,

a) $\displaystyle\lim_{x\to 0+} x(\ln x)^2$.

b) $\displaystyle\lim_{x\to\infty} (\ln x)^{(1/x)}$ (Hint: Take ln and use L'Hôpital's Rule.)

(10) **4.** Suppose the temperature of a hot rock is given by

$$T(t) = 200e^{-kt}.$$

If the temperature at time $t=1$ is $T=100$, what is the temperature at time $t=3$?

(10) **5.** Show that, if $x>0$, then

$$x^{(2x)} = (x^2)^x.$$