FINAL EXAM **Tuesday, Mar. 16** **NAME:**

Note: Just because a formula or theorem is given here, does not mean that it is necessary for any of the given problems. Use these as needed only.

INTEGRATION FORMULAS:

$$\int \frac{\sqrt{a+bx}}{x}dx = 2\sqrt{a+bx} + a\int \frac{1}{x\sqrt{a+bx}}dx$$

$$\int \frac{1}{x\sqrt{a+bx}}dx = \frac{2(3bx-2a)(a+bx)^{3/2}}{15b^2}$$

$$\int \sqrt{x^2 \pm a^2}dx = \frac{1}{2}\left[x\sqrt{x^2 \pm a^2} + a^2 \log\left|x + \sqrt{x^2 \pm a^2}\right|\right]$$

$$\int \frac{1}{\sqrt{a^2-x^2}}dx = \sin^{-1}\left(\frac{x}{a}\right) \quad (a > 0)$$

$$\int \frac{1}{a^2+x^2}dx = \frac{1}{a}\tan\left(\frac{x}{a}\right) \quad (a > 0)$$

$$\int \frac{1}{\sqrt{a^2+x^2}}dx = \log\left(x + \sqrt{a^2+x^2}\right) = \sinh^{-1}\left(\frac{x}{a}\right) \quad (a > 0)$$

INTEGRAL THEOREMS:

$\int\int\int_W (\nabla \cdot \mathbf{F})\, dV$	=	$\int\int_{\partial W} \mathbf{F} \cdot d\mathbf{S}$,	Gauss's Divergence Theorem
$\int\int_S (\nabla \times \mathbf{F}) \cdot d\mathbf{S}$	=	$\int_{\partial S} \mathbf{F} \cdot d\mathbf{s}$,	Stokes's Theorem
$\int\int_{\partial D} \mathbf{F} \cdot \mathbf{n} ds$	=	$\int\int_D \nabla \cdot \mathbf{F} dA$,	Divergence Theorem in the Plane
Area inside of the closed path C	=	$\frac{1}{2}\int_{C^+} xdy - ydx$,	Area derived from Green's Theorem
$\int_{\partial D} Pdx + Qdy$	=	$\int\int_D \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right) dxdy.$	Green's Theorem