CALCULUS BC
WORKSHEET ON L'HOPITAL'S RULE AND IMPROPER INTEGRALS

Work the following on **notebook paper**.

Evaluate.

1. $\lim_{x\to 0} \dfrac{1-\cos x}{x+x^2}$

2. $\lim_{x\to 0} \dfrac{\sqrt{1+x}-1-\frac{x}{2}}{x^2}$

3. $\lim_{x\to 1} \left(\dfrac{1}{\ln x} - \dfrac{1}{x-1}\right)$

4. $\lim_{\theta\to \frac{\pi}{2}} \dfrac{1-\sin\theta}{1+\cos 2\theta}$

5. $\lim_{x\to 0} \dfrac{\cos x - 1}{e^x - x - 1}$

6. $\lim_{x\to 0} \left(e^x + x\right)^{1/x}$

7. $\lim_{x\to \frac{\pi}{2}^-} (\cos x)^{\cos x}$

Evaluate.

8. $\int_0^\infty \dfrac{2x}{\left(x^2+1\right)^2}\,dx$

9. $\int_0^1 \dfrac{dx}{\sqrt{1-x^2}}$

10. $\int_0^{\ln 2} \dfrac{e^{1/x}}{x^2}\,dx$

11. $\int_{-8}^1 \dfrac{dx}{\sqrt[3]{x}}$

12. $\int_{-\infty}^2 \dfrac{2}{x^2+4}\,dx$

13. $\int_2^\infty \dfrac{3}{x^2-x}\,dx$

14. $\int_0^2 \dfrac{x+1}{\sqrt{4-x^2}}\,dx$

15. $\int_{-1}^\infty \dfrac{dx}{x^2+5x+6}$

16. $\int_{-\infty}^0 xe^x\,dx$

17. Let $f(x) = xe^{-x}$ for $0 \le x < \infty$, and let R be the unbounded region between f and the x-axis. Find the volume of the solid generated when R is revolved about the x-axis.