Calculus Review Set

1. Integration

$$\text{a)} \int_0^2 (4x - 2x^2)dx; \qquad \text{b)} \int_0^\infty e^{-x/3}dx; \qquad \text{c)} \int_{100}^{150} x^{-2}dx.$$

2. Integration by parts: $(\int udv = uv - \int vdu)$

$$\text{a)} \int_0^\infty xe^{-x/3}dx; \qquad \text{b)} \int_1^2 \ln(x)\,dx; \qquad \text{c)} \int_0^\infty x^2e^{-x/3}dx.$$

3. Change of variables (integration by substitution): $(\int_a^b f(g(x))g'(x)dx = \int_{g(a)}^{g(b)} f(u)du.)$

$$\text{a)} \int_0^1 x^2\sqrt{x^3 + a}\,dx; \qquad \text{b)} \int_0^1 \frac{x^2}{(x^3+5)^4}\,dx;$$

$$\text{c)} \int_{-0.5}^{0.5} \frac{x^3}{\sqrt{1-x^2}}\,dx; \qquad \text{d)} \int_0^1 \sqrt{1-x^2}\,dx.$$

Use trigonometric substitutions for 3c) and 3d).

4. Double integrals

$$\text{a)} \iint\limits_{\substack{x>y \\ 0<x<\infty \\ 0<y<\infty}} e^{-x/3}\,dydx; \qquad \text{b)} \iint\limits_{\substack{x^3<y<x^2 \\ 0<x<1 \\ 0<y<1}} xy^2\,dxdy.$$

5. Interchange the order of integration (sketch the region of integration first)

$$\text{a)} \int_0^2 \int_{y/2}^1 ye^{x^3}\,dxdy; \qquad \text{b)} \int_{-2}^2 \int_{x^2}^4 x^2y\,dydx; \qquad \text{c)} \int_0^1 \int_y^1 e^{-x^2}\,dxdy.$$