

Name:

Section: 5 6 9 10

1. Write the abstract partial fraction decomposition for

$$\frac{x^3 - 8x^2 - 17x + 10}{x^3(x^2 + 1)^2(x - 2)}$$

$$\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{Dx+E}{x^2+1} + \frac{Fx+G}{(x^2+1)^2} + \frac{H}{x-2}$$

2. Solve the integral  $\int x^3 \sqrt{1-x^2} dx$  using a trigonometric substitution.

$$x = \sin \theta$$

$$dx = \cos \theta d\theta$$

$$x^3 = \sin^3 \theta$$

$$\sqrt{1-x^2} = \cos \theta$$

$$\int \sin^3 \theta \cdot \cos \theta \cdot \cos \theta d\theta$$

$$= \int \sin^3 \theta \cos^2 \theta d\theta$$

$$= \int \sin^2 \theta \cos^2 \theta \sin \theta d\theta$$

$$= \int (1-u^2) u^2 (-du)$$

$$= \int u^4 - u^2 du$$

$$= \frac{\cos^5 \theta}{5} - \frac{\cos^3 \theta}{3} + C$$

OPP power  
of sin

do

$$u = \cos \theta$$

$$\sin^2 \theta = 1 - \cos^2 \theta$$

$$= 1 - u^2$$

$$du = -\sin \theta d\theta$$

$$= \frac{(\sqrt{1-x^2})^5}{5} - \frac{(\sqrt{1-x^2})^3}{3} + C$$