Math 222 Discussion Worksheet #3  
Spring 2015  

Difference of squares \((a^2 - b^2)\)  
\((a - b)(a + b)\) 

Difference of cubes \((a^3 - b^3)\)  
\((a - b)(a^2 + ab + b^2)\) 

Sum of cubes \((a^3 + b^3)\)  
\((a + b)(a^2 - ab + b^2)\) 

For a quadratic equation of the form \(F(x) = ax^2 + bx + c\), the discriminant is defined as \(b^2 - 4ac\) 

<table>
<thead>
<tr>
<th>(b^2 - 4ac)</th>
<th>(F(x)) has no real roots. (F(x)) is in canonical form.</th>
<th>(b^2 - 4ac = 0)</th>
<th>(F(x)) has one real distinct root</th>
<th>(b^2 - 4ac &gt; 0)</th>
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<td>&lt; 0</td>
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Write out the form of the partial fraction decomposition. Do not solve for the coefficients. 

A. \(\frac{1}{(x-1)(x-2)^2(x-3)^3}\) 

B. \(\frac{x+1}{(x^3-1)^2}\) 

C. \(\frac{2}{x^2(x^2-1)(x^3+1)}\)
Solve the following indefinite integrals.

A. $\int \frac{1}{x^2 - 9} \, dx$

B. $\int \frac{9x^3 - 3x + 1}{x^3 - x^2} \, dx$

C. $\int \frac{x^2 + 3x + 1}{x^4 + x^2} \, dx$

D. $\int \frac{x}{x^2 + 6x + 11} \, dx$

E. $\int \frac{1}{x\sqrt{x} + 9} \, dx$