# Test 4 (Final) Review

31.1 Order of the Differential Equation - Highest Derivative.

31.2 Separation of Variables $g(x)\,dx = f(y)\,dy$

p. 945: 3, 5, 9, 13, 17, 19, 21, 35, 37

$$xy\frac{dy}{dx} + \sqrt{1+y^2} = 0$$

$$xy\,dy + \sqrt{1+y^2}\,dx = 0 \Rightarrow \frac{y}{\sqrt{1+y^2}}\,dy + \frac{1}{x}\,dx = 0$$

31.3 Integrable Combinations

p. 947: 3, 5, 11, 13, 19, 21

$$d(xy) = x\,dy + y\,dx$$

$$d(x^2+y^2) = 2x\,dx + 2y\,dy$$

$$d\left(\frac{y}{x}\right) = \frac{x\,dy - y\,dx}{x^2} \qquad d\left(\frac{x}{y}\right) = \frac{y\,dx - x\,dy}{y^2}$$

31.4 First Order Linear Differential Equation (Integrating Factor)

$$dy + Py\,dx = Q\,dx$$

Integrating Factor: $e^{\int P\,dx}$

$$d\left(e^{\int P\,dx}\,y\right) = e^{\int P\,dx}\,Q\,dx$$

p. 950: 3, 5, 7, 9, 11, 31

31.7 Higher Order Homogeneous Solution

p. 962: 3, 5, 7, 9, 13, 15, 23, 31

Auxiallary Equation then $y = c_1 e^{m_1 x} + c_2 e^{m_2 x}$

31.8 Auxiliary Equations with Repeated or Complex Roots

p. 966 5 - 33 odd

Repeated roots $\Rightarrow$ $y = e^{mx}(c_1 + c_2 x)$

Complex roots $\Rightarrow$ $y = e^{\alpha x}(c_1 \cos\beta x + c_2 \sin\beta x)$

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Test 1 Derivatives Trigonometric, Log, Exp. Functions. 1-4

test 2 8+9 Integrals 1-6 Trig., Log, & Exp. Functions