

Name: _____

Quiz 3, Section 2.3, due on _____

(10 pts) Solve the initial value problem $(x+2)^2 \frac{dy}{dx} + (6+3x)y = 5$ with $y(0) = 1$ using an integrating factor. Be sure to put the equation in standard form before proceeding.

$$\div (x+2)^2$$

$$\frac{dy}{dx} + \frac{3(2+x)}{(x+2)^2} y = \frac{5}{(x+2)^2}$$

$$\frac{dy}{dx} + \frac{3}{x+2} y = \frac{5}{(x+2)^2}$$

$$P = \frac{3}{x+2}$$

$$k = e^{\int \frac{3}{x+2} dx} = e^{3 \ln(x+2)} = e^{\ln(x+2)^3} = (x+2)^3$$

implied domain
is $x > -2$, so
 $x+2 > 0$

multiply by $(x+2)^3$

$$\frac{d}{dx} \left((x+2)^3 y \right) = 5(x+2)$$

integrate

$$(x+2)^3 y = \frac{5}{2} (x+2)^2 + C$$

$$y = \frac{5/2}{x+2} + \frac{C}{(x+2)^3}$$

$$1 = y(0) = \frac{5/2}{2} + \frac{C}{2^3} = \frac{5}{4} + \frac{C}{8}$$

$$-\frac{1}{4} = \frac{C}{8}$$

$$-2 = C$$

$$y = \frac{5/2}{x+2} - \frac{2}{(x+2)^3}$$