SEPARABLE DIFFERENTIAL EQUATIONS WORKSHEET

MATH 3 / FALL 2012

(a) Separate the x's and the y's

(b) Integrate both sides

(c) Solve for y

1. **(a)** $dy = -\pi\, dx$
(b) $y = -\pi x + C$
(c) $y = -\pi x + C$

2. **(a)** $y^{-2}\, dy = x\, dx$
(b) $-y^{-1} = x^2/2 + C$
(c) $y = \dfrac{1}{C - x^2/2}$

3. **(a)** $y^{-1}\, dy = x^2\, dx$
(b) $\ln|y| = x^3/3 + C$
(c) $y = Ke^{x^3/3}$

4. **(a)** $\cot(y)\, dy = \sin(x)\, dx$
(b) $\ln|\sin(y)| = -\cos(x) + C$
(c) $y = \arcsin\left(Ke^{-\cos(x)}\right)$

5. **(a)** $\sec^2(y)\, dy = e^x\, dx$
(b) $\tan(y) = e^x + C$
(c) $y = \arctan(e^x + C)$

6. **(a)** $y\, dy = (x^2 - 2x)\, dx$
(b) $y^2/2 = x^3/3 - x^2 + C$
(c) $y = \pm\sqrt{2x^3/3 - 2x^2 + C}$

7. **(a)** $e^y\, dy = (x^2 - 2x)dx$
(b) $e^y = x^3/3 - x^2 + C$
(c) $y = \ln(x^3/3 - x^2 + C)$

8. **(a)** $y^{-1/2}\, dy = -\dfrac{x}{\sqrt{1-x^2}}dx$
(b) $2y^{1/2} = \sqrt{1-x^2} + C$
(c) $\left(\frac{1}{2}\sqrt{1-x^2} + C\right)^2$

9. **(a)** $2y\, dy = (3x - x^2)dx$
(b) $y^2 = 3x^2/2 - x^3/3 + C$
(c) $y = \pm\sqrt{3x^2/2 - x^3/3 + C}$

10. **(a)** $\dfrac{dy}{3 - 2y} = \dfrac{dx}{x}$
(b) $-\frac{1}{2}\ln|2y - 3| = \ln|x| + C$
(c) $y = \dfrac{K}{x^2} + \dfrac{3}{2}$