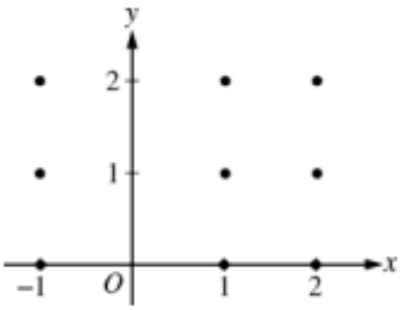
Ch. 5&6 Test Review WS #4

1)Consider the differential equation $\frac{dy}{dx} = (x^3 - 3)(2y - 1)$

a) On the axes below, sketch a slope field for the given differential equation at the nine points indicated



b) Find the particular solution $y = f(x)$ to the given differential equation with the initial condition $f(0) = 1$.

c) Find the equation of the line tangent to $y = f(x)$ at the point where $x = 0$ and use it to approximate $f(0.2)$.

2) $\int_0^3 \frac{3e^x}{\sqrt{1 + 2e^x}} dx =$

3) Word Problem: The rise in population of a town is directly proprtional to the number present at any given time t.

a) Write the differential equation and the general solution

b) Population doubled in the 50 years between 1920 and 1970. In 1998, the population was 75,500. What was the population in 1920?

4) _____ Match the differential equation with the slope field graphed to the right.

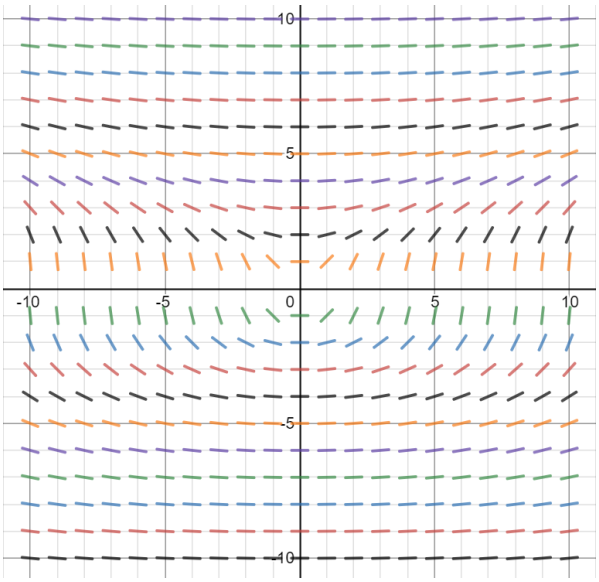
A) $\frac{dy}{dx} = \frac{x^2}{-y}$

B) $\frac{dy}{dx} = \frac{x}{y^2}$

C) $\frac{dy}{dx} = \frac{x^2}{y^2}$

D) $\frac{dy}{dx} = \frac{x}{y^3}$

E) $\frac{dy}{dx} = \frac{y^2}{x}$



5) $\int \sin\left(\frac{\pi x}{3}\right) - csc(5x)\,dx =$

6) $\int \frac{3x}{(4x^2)\sqrt{16x^4-7}}dx =$

7) $\int \frac{7}{x^2+16x+67}dx =$

8)

$$\int_1^3 \frac{2x^3-5}{x+1}dx =$$

9)

$$\int \frac{5}{2x \ln x^3}\ \mathrm{dx}$$

(Chapter 5) Derivative & Integral Rules Reference Sheet

Derivative Rules:

Power Rule:

$$\frac{d}{dx}x^n = nx^{n-1}$$

Trig Derivatives:

$\frac{d}{dx}\sin u = \cos u * u'$	$\frac{d}{dx}\cos u = -\sin u * u'$
$\frac{d}{dx}\tan u = \sec^2 u * u'$	$\frac{d}{dx}\cot u = -csc^2 u * u'$
$\frac{d}{dx}\sec u = \sec u \tan u * u'$	$\frac{d}{dx}\csc u = -\csc u \cot u * u'$

$\frac{d}{dx}e^u = e^u * u'$	$\frac{d}{dx}\ln u = \frac{u'}{u}$
$\frac{d}{dx}a^u = \ln a * a^u * u'$	$\frac{d}{dx}log_a u = \frac{1}{\ln a} * \frac{u'}{u}$

Integral Rules:

Power Rule:

$$\int u^n du = \frac{u^{n+1}}{n+1} + C$$

Trig Integrals:

$$\int sin\, u\, du = -cos\, u + C \qquad \int cos\, u\, du = sin\, u + C$$

$$\int sec^2 u\, du = tan\, u + C \qquad \int sec\, u\, tan\, u\, du = sec\, u + C$$

$$\int csc^2 u\, du = -cot\, u + C \qquad \int csc\, u\, cot\, u\, du = -csc\, u + C$$

$$\int \frac{1}{u} du = \ln|u| + C \qquad \int e^u du = e^u + C \qquad \int a^u du = \left(\frac{1}{\ln a}\right)a^u + C$$

More Trig Integral Rules:

$$\int \tan u\, du = -\ln|\cos u| + C \qquad \int \sec u\, du = \ln|\sec u + \tan u| + C$$

$$\int \cot u\, du = \ln|\sin u| + C \qquad \int \csc u\, du = -\ln|\csc u + \cot u| + C$$

Arc-Trig Integral Rules

16. $\int \frac{du}{\sqrt{a^2 - u^2}} = \arcsin\frac{u}{a} + C$

17. $\int \frac{du}{a^2 + u^2} = \frac{1}{a}\arctan\frac{u}{a} + C$

18. $\int \frac{du}{u\sqrt{u^2 - a^2}} = \frac{1}{a}\operatorname{arcsec}\frac{|u|}{a} + C$

Arc-Trig derivative Rules

19. $\frac{d}{dx}[\arcsin u] = \frac{u'}{\sqrt{1 - u^2}}$

20. $\frac{d}{dx}[\arccos u] = \frac{-u'}{\sqrt{1 - u^2}}$

21. $\frac{d}{dx}[\arctan u] = \frac{u'}{1 + u^2}$

22. $\frac{d}{dx}[\operatorname{arccot} u] = \frac{-u'}{1 + u^2}$

23. $\frac{d}{dx}[\operatorname{arcsec} u] = \frac{u'}{|u|\sqrt{u^2 - 1}}$

24. $\frac{d}{dx}[\operatorname{arccsc} u] = \frac{-u'}{|u|\sqrt{u^2 - 1}}$