Worksheet 07/21 Calculus I Summer B 2017 **Group nr:** _____

1) In each case, find the general antiderivative:

(a) $\int 3x^4 - 4\sqrt{x} + \frac{7}{x^2}\, dx$,

(b) $\int \frac{1}{\sqrt{1-x^2}}\, dx$

(c) $\int \frac{1}{2x^3} + \csc x \cot x\, dx$

(d) $\int (\sec^2 x + \frac{3}{\sqrt{x}} - \pi)\, dx$

(e) $\int \frac{x^2-3}{2x}\, dx$

(f) $\int \frac{x^2}{x^2+1}\, dx$

2) In each case, find the most general form of f satisfying the given condition.

(a) $f'(x) = x(3x + 4)$

(b) $f''(x) = \sqrt[3]{x} + 1$

3) Solve the following initial value problems:

(a) $\frac{dy}{dx} = 6e^x$, $y(0) = 2$

(b) $\frac{dy}{dx} = \sqrt{x}(6 + 5x)$, $y(1) = 0$

4) A particle is moving on a straight line with the given data. Find the position $s(t)$ of the particle at time t.

(a) $v(t) = -32t + 100$, $s(0) = 20$,

(b) $a(t) = 2\cos t + \sin t$, $v(0) = 1$, $s(0) = 0$.

5) A stone is dropped from the top of a tower 800 ft above the ground.

(a) Find the height $s(t)$ of the stone above the ground at t seconds since it was dropped. Assume the initial velocity is 0 and assume constant acceleration during the motion $a = -32ft/s^2$ (the gravitational acceleration, often denoted g).

(b) How long does it take the stone to reach the ground?

(c) With what velocity does it strike the ground?

6) A car braked with constant deceleration of 16ft/s^2, producing skid marks measuring 200ft before coming to a stop. How fast was the car traveling when the brakes were applied?

7) Compute the following integrals using integration by substitution and the given substitution:

(a) $\int \frac{2x+1}{x^2+x}\,dx$ using $u = x^2 + x$

(b) $\int \frac{1}{x(\ln x)^2}\,dx$ using $u = \ln x$

(c) $\int \sin^4(3x)\cos(3x)\,dx$ using $w = \sin(3x)$

8) Compute the following integrals using integration by substitution:

(a) $\int e^{5x}\,dx$

(b) $\int \cos^5 x \sin x\,dx$

(c) $\int \sqrt{3x+7}\,dx$

(d) $\int (x^2+4x+7)^9(x+2)\,dx$

(e) $\int x\sec(x^2)\tan(x^2)\,dx$

9) Compute the following integrals using integration by substitution.

(a) $\int \frac{e^{2x}}{1+e^{2x}}\,dx$

(b) $\int \frac{e^{x}}{1+e^{2x}}\,dx$

(c) $\int \frac{1}{x^2+a^2}\,dx$ where a is a constant.

(d) $\int \frac{t}{\sqrt{1-t^4}}\,dt$

(e) $\int \frac{\sin\theta}{1+\cos^2\theta}\,d\theta$

(f) $\int \tan(x)\,dx$

(g) $\int x\sqrt{2x+1}\,dx$

(h) $\int \frac{\cos(1/x)}{3x^2}\,dx$