Due date: _____ **Name:** _____

1. Evaluate the following integrals.

   a) $\int_{-2}^{2}(x^3 - 2x + 3)\,dx$

   b) $\int_{1}^{32} \frac{1}{\sqrt[5]{x^6}}\,dx$

   c) $\int_{0}^{\pi/4}(x + \sin x)\,dx$

   d) $\int_{-\pi/3}^{\pi/3} \frac{1-\cos 2x}{2}\,dx$

e) $\int_2^3 \left(\frac{2}{x} + 5\right) dx$

f) $\int_1^2 \left(\frac{1}{x} - e^{-x}\right) dx$

g) $\int_{\pi/4}^{\pi/3} (\sec x \tan x - x)\, dx$

h) $\int_{\pi/4}^{\pi/3} (x^2 + \csc x \cot x)\, dx$

i) $\int_0^{1/2} \frac{3}{\sqrt{1-x^2}}\,dx$

j) $\int_0^1 \frac{2}{1+x^2}\,dx$

k) $\int_1^9 \left(x\sqrt{x}-2\right)\,dx$

l) $\int_1^9 \frac{x-1}{\sqrt{x}}\,dx$

m) $\int_0^1 \left(2 + \frac{x+1}{\sqrt{x}} + 2^x\right) dx$

2. Use Part 1 of the Fundamental Theorem of Calculus to find the derivative of the following.

a) $y = \int_{-2}^{x} \sqrt{t + t^3}\, dt$

b) $y = \int_{x}^{3} \ln(t^2 + 2)\, dt$

c) $y = \int_{-1}^{x^2} \frac{t^2}{t^2+4}\, dt$

d) $f(x) = \int_{7}^{\tan x} e^{t^2}\, dt$

e) $y = \int_{\tan x}^{0} \frac{dt}{1+t^2}$

f) $y = \int_{\sin x}^{3} \frac{\sqrt{t}}{t+t^2}\, dt$

g) $f(x) = \int_{\ln x}^{x^2} \sin t^2\, dt$

h) $f(x) = \int_{-x^2}^{\sqrt{x}} \tan^{-1} t\, dt$

3. Suppose the velocity function of a particle is $v(t) = 3t^2 - 3$ (in meters per second).
   a) Find the displacement of the particle during the time period $-2 \leq t \leq 2$.

   b) Find the distance traveled by the particle during the same time period $-2 \leq t \leq 2$.

4. Suppose the acceleration function of a particle is $a(t) = 4t$ (in m/s^2), and $v(0) = -8$ is the initial velocity.
   a) Find the displacement of the particle during the time period $1 \leq t \leq 4$.

   b) Find the distance traveled by the particle during the time period $1 \leq t \leq 4$.

5. Suppose the acceleration function of a particle is $a(t) = 2t + 3$ (in m/s^2), and $v(0) = -4$ is the initial velocity. Find the distance traveled by the particle during the time period $0 \leq t \leq 3$.

Q: What is always coming but never arrives?

Optional exercises from the Stewart textbook if you'd like more practice:
5.3 (p.399) #3, 7-41 odd, 59, 61
5.4 (p.408) #21-43 odd, 51, 53, 59, 61