Mat 115 Worksheet 1
Tuesday, Oct 3 2017

Name:

Important info: Welcome to the mat 115 workshops! My name is **Diego Avalos** (avalosgalvez@cpp.edu), and I will be your workshop facilitator. We meet on Tuesdays and Thursdays from 4 to 5:50 pm. My office hour is on Mondays from 11:30 am to 12:30 pm in room 3-2117. All worksheets and solutions may be found at the website **www.diegoavalos.net/teaching/mat115workshop2017**.

Find an antiderivative for each of the functions 1 to 9.

1. $f(x) = x^7 - x^5 + e^x - \pi x$
2. $g(x) = \cos x \sin^2 x$
3. $h(t) = \dfrac{e^t - e^{-t}}{2}$
4. $s(t) = -\csc^2(2t)$
5. $p(z) = \sin^2 z + \cos^2 z$
6. $L(\theta) = \dfrac{1}{3}\csc(3\theta)\cot(3\theta)$
7. $f(u) = \dfrac{1}{\sqrt{1-u^2}}$
8. $f(x) = \dfrac{5+2x^2}{1+x^2}$
9. $T(y) = (y^{-1}+1)(y^2 + y^{-3/2})$
10. Solve $y'(x) = 2x + e^{-x}$, $y(1) = 1$.
11. The gravity at the surface of the moon is $g = 1.6\ m/s^2$. An astronaut on the moon drops an object from a height of 5 meters.
    a. Find a height function $H(t)$ of time t that models the distance from the object to the ground in meters. (Recall that $H''(t) = -g$).
    b. How long does it take for the object to hit the ground?
    c. How long does it take for the object to hit the ground if it is dropped from a height of 10 meters instead?
12. Approximate the integral
$$\int_1^5 \frac{1}{\sqrt{x}}\,dx$$
using a left-Riemann sum with $n = 4$ rectangles.
13. The horizontal velocity (in m/s) of a projectile is given by the function $v(t) = -2t + 12$, where t is in seconds. The horizontal displacement (in meters) of the projectile before it hits the ground is given by the integral
$$\int_0^6 v(t)\,dt.$$
Use geometry to find the displacement of the projectile before it hits the ground.

Find the definite integrals in problems 14 to 17 using geometry

14. $\displaystyle\int_{-6}^{-2} |x| + 1\,dx$
15. $\displaystyle\int_{-1}^{2} 3 - 2x\,dx$
16. $\displaystyle\int_0^2 \sqrt{-x^2+2x}\,dx$ (Hint: complete the square)
17. $\displaystyle\int_0^{3/2} \sqrt{-x^2+2x}\,dx$
18. If $\int_{-2}^0 f(x)\,dx = 5$ and $\int_0^3 f(x)\,dx = -7$, compute
    a. $\int_{-2}^3 -4f(x)\,dx$
    b. If f takes on positive values on $[-2,0)$ and negative values on $(0,3]$, find $\int_{-2}^3 |f(x)| + \pi\,dx$
19. Given that $\int_0^\pi \sin x\,dx = 2$, answer the following questions.
    a. What is $\int_0^{3\pi} |\sin x|\,dx$?
    b. What is $\int_0^{5\pi/2} |\sin x|\,dx$?
    c. Compute
$$\lim_{n\to\infty} \frac{1}{n\pi + 1}\int_0^{n\pi} |\sin x|\,dx.$$
20. What should the value of $\int_{-\pi}^{\pi} \sin^3(x)\,dx$ be?