

Exam 3 – Review Sheet

Sections: 15.3 - 16.5

*In addition to solving the following problems,
 make sure you have reviewed all the problems from class and homework's.*

1. Differentiate: a) $y = 5^x$ b) $f(x) = (4.3)^{5x}$ c) $g(x) = (12)^{-2x^3-1}$ d) $h(x) = x^3(2.1)^{2x}$	2. Differentiate: a) $y = \log_2(3x)$ b) $f(x) = -7 \log(x^2)$ c) $g(x) = x^6 \log(-4x)$ d) $h(x) = \log_8(2x^4 - 3x)$
3. Find each Antiderivative: a) $\int x^{200} dx$ e) $\int \frac{1}{x} dx$ b) $\int \sqrt[6]{x} dx$ f) $\int 5x^3 dx$ c) $\int \frac{1}{x^4} dx$ g) $\int e^{-3x} dx$ d) $\int \frac{1}{5} dx$ h) $\int e^{\frac{1}{2}x} dx$ (e^ half x power)	4. Determine the following indefinite integrals: a) $\int (2x^4 + 3x^3 - 7x^2 + x - 5) dx$ b) $\int (x - 5)^2 dx$ g) $\int \frac{(\ln x)^2}{x} dx$ c) $\int \frac{x^2-7x+2}{x^2} dx$ h) $\int x^2 e^{4x^3} dx$ d) $\int 4x(2x^2 + 3)^3 dx$ i) $\int x^6(x^7 + 10)^5 dx$ e) $\int \frac{e^x}{1+e^x} dx$ j) $\int \frac{x}{x^2+1} dx$ f) $\int \frac{6x^2}{\sqrt{3+2x^3}} dx$
5. a) Find a function f such that $f'(x) = 4x^2 - 2x - 1$ and $f(-1) = 2$ b) Find the function g such that $g'(x) = e^{2x}$ and the point $(0, 3)$ is a solution to g.	6. Evaluate: a) $\int_2^5 (4x - 3) dx$ c) $\int_0^{\ln 4} 2e^x dx$ b) $\int_{-1}^2 x^2(-2x^3 - 3)^3 dx$ d) $\int_1^5 \frac{x-1}{x} dx$ e) $\int_0^2 (x+1)(x^2 + 2x + 3)^4 dx$
7. Physics: A baseball is thrown directly upward with initial velocity of 75 ft/sec from an initial height of 30 ft. The velocity of the baseball is given by: $v(t) = -32t + 75$, where t is the number of seconds since the ball was released and v is in ft/sec. a) Find the function h that gives the height (in feet) of the baseball after t seconds if we know that at $t = 0$, the ball is 30 ft above ground. b) what are the height and velocity of the baseball after 2 seconds of flight? c) After how many seconds does the ball reach its highest point? (hint: the ball "stops" for a moment before falling downward, $v(t) = 0$) d) How high does the ball get at its highest point? (the highest point would be where the ball starts to fall downward, your solution to c) e) After how many seconds will the ball hit the ground? (the ball will hit ground when the height $h(t) = 0$) f) What is the balls velocity at the moment it hits the ground? (from e you found the time t when the ball hits the ground so use that t to find its velocity the moment it hits the ground)	

8. Find the area under the graph of $y = g(x)$ from -3 to 6, where $g(x) = \begin{cases} x^2, & x \leq 2 \\ 8 - x, & x > 2 \end{cases}$	9. a) Find the area of the region bounded by the graphs of $y = \sqrt{x}$ and $y = \frac{1}{3}x$ (set both equal and solve for x: square both sides) b) Find the area bounded by the curve: $y = 8x - x^2$ and $y = 3x$ c) Find the area between: $y = 2x + 3$ and $y = -x^2 + 10x - 9$
10. Two of the six word problems from 15.3 and 15.4 Exponential Growth and Decay	

Solutions

1. a) $y' = (\ln 5)5^x$ b) $f'(x) = 5 \ln(4.3)(4.3)^{5x}$ c) $g'(x) = \ln(12)(12)^{-2x^3-1}(-6x^2)$ d) $h'(x) = 2x^3(\ln 2.1)(2.1)^{2x} + (3x^2)(2.1)^{2x}$ $h'(x) = x^2(2.1)^{2x} [2x(\ln 2.1) + 3]$	2. a) $y' = \frac{1}{x \ln 2}$ b) $f'(x) = \frac{-14}{x \ln 10}$ c) $g'(x) = \frac{x^5}{\ln 10} + 6x^5 \log(-4x)$ $g'(x) = x^5 \left[\frac{1}{\ln 10} + 6 \log(-4x) \right]$ d) $h'(x) = \frac{8x^3-3}{\ln(8)(2x^4-3x)}$
3. a) $\frac{1}{201}x^{201} + C$ e) $\ln x + C$ b) $\frac{6}{7}x^{\frac{7}{6}} + C$ f) $\frac{5x^4}{4} + C$ or $\frac{5}{4}x^4 + C$ c) $-\frac{1}{3x^3} + C$ g) $-\frac{1}{3e^{3x}} + C$ d) $\frac{x}{5} + C$ or $\frac{1}{5}x + C$ h) $2e^{\frac{1}{2}x} + C$	4. a) $\frac{2}{5}x^5 + \frac{3}{4}x^4 - \frac{7}{3}x^3 + \frac{1}{2}x^2 - 5x + C$ b) $\frac{1}{3}x^3 - 5x^2 + 25x + C$ c) $x - 7 \ln x - \frac{2}{x} + C$ h) $\frac{1}{12}e^{4x^3} + C$ d) $\frac{1}{4}(2x^2 + 3)^4 + C$ i) $\frac{(x^7+10)^6}{42} + C$ e) $\ln 1 + e^x + C$ j) $\frac{1}{2} \ln x^2 + 1 + C$ f) $2\sqrt{3 + 2x^3} + C$ g) $\frac{1}{3}(\ln x)^3 + C$
5. a) $f(x) = \frac{4}{3}x^3 - x^2 - x + \frac{10}{3}$ b) $g(x) = \frac{1}{2}e^{2x} + \frac{5}{2}$	6. a) 33 b) -5430 c) 6 d) $4 - \ln 5 \approx 2.39$ e) 16,080.8
7. a) $h(t) = -16t^2 + 75t + 30$ b) $h(2) = 116 \text{ ft}$ $v(2) = 11 \text{ ft/sec}$ c) $t = 2.344 \text{ sec}$ d) $h(2.344) = 117.89 \text{ ft}$ e) 5.06 sec (Quadratic formula) f) $v(5.06) = -86.92 \text{ ft/sec}$	8. $\frac{83}{3}$
9. a) intersects at $x = 0$ and 9, $A = \frac{9}{2}$ b) intersects at $x = 0$ and 5, $A = \frac{125}{6}$ c) intersects at $x = 2$ and 6, $A = \frac{32}{3}$	