Homework for Test #1

- 3.9 #5, 9; 11-19 odd; 45, 49
- 4.1 #5-33 odd; 55-61 odd; 67, 83
- 4.2 #7-19odd; 27-37odd; 41,43,47,53
- 4.3 #7,17,37,43,45
- 4.4 #13, 15, 23, 31

Hw: #20-26 on THQ

HW 4.4: 45-51 odd, 75-91 odd

4.5 # 7-33, 41-53, 57-63 odd

4.1 Antiderivatives

$$F(x) = 5x^4$$

$$f(x) = x^5 \qquad [f(x)]' = 5x^4$$

particular solution

General solution: $x^5 + C$

Find a general solution and a particular solution to the differential equation.

56. $g'(x) = 6x^2$, $g(0) = -1$

$y' = 6x^2$

$y = 2x^3 + C$ ← general solution

$-1 = 2(0)^3 + C$

$C = -1$

$\boxed{y = 2x^3 - 1}$ ← particular solution

$y = F(x)$

$\frac{dy}{dx} = f(x)$ differential $dy = f(x)dx$

antiderivative = indefinite integral

$\int dy = \int f(x)\,dx$

$y = \int f(x)\,dx = F(x) + C$

18. $\int (4x^3 + 6x^2 - 1)\,dx$

$= \boxed{x^4 + 2x^3 - x + C}$

24. $\int (\sqrt[4]{x^3} + 1)\,dx = \int (x^{3/4} + 1)\,dx$

$= \boxed{\frac{4}{7}x^{7/4} + x + C}$

$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$$

$x^{-1} = \frac{1}{x}$

28. $\int \frac{x^2 + 2x - 3}{x^4}\,dx = \int (x^{-2} + 2x^{-3} - 3x^{-4})\,dx$

$= \boxed{-x^{-1} - x^{-2} + x^{-3} + C}$

38. $\int (\theta^2 + \sec^2\theta)\,d\theta$

$= \boxed{\frac{1}{3}\theta^3 + \tan\theta + C}$

42. $\int \frac{\cos x}{1-\cos^2 x}\,dx = \int \frac{\cos x}{\sin^2 x}\,dx$

$= \int \frac{1}{\sin x} \cdot \frac{\cos x}{\sin x}\,dx = \int \csc x \cot x\,dx$

$= \boxed{-\csc x + C}$

40. $\int \sec y(\tan y - \sec y)\,dy$

$= \int (\sec y \tan y - \sec^2 y)\,dy$

$= \boxed{\sec y - \tan y + C}$

58. $f'(s) = 6s - 8s^3$, $f(2) = 3$

$$\boxed{f(s) = 3s^2 - 2s^4 + C}$$ general solution

$$3 = 3(2)^2 - 2(2)^4 + C$$

$$3 = 12 - 32 + C$$

$$23 = C$$

particular solution: $\boxed{f(s) = 3s^2 - 2s^4 + 23}$

62. $f''(x) = \sin x$, $f'(0) = 1$, $f(0) = 6$

$$f'(x) = -\cos x + C_1$$

$$f(x) = -\sin x + C_1 x + C_2$$ general solution

$$1 = -\cos(0) + C_1$$

$$1 = -1 + C_1$$

$$2 = C_1$$

$$6 = -\sin(0) + 2(0) + C_2$$

$$6 = C_2$$

$$\boxed{f(x) = -\sin x + 2x + 6}$$ particular solution

$s(t) =$ position $\quad s \quad m$

$v(t) = s'(t) =$ velocity $\quad \frac{\Delta s}{\Delta t} \quad m/s$

$a(t) = v'(t) = s''(t) =$ acceleration $\quad \frac{\Delta s / \Delta t}{\Delta t} \quad m/s^2$

$a(t) = -32 \text{ ft/s}^2$

$v(t) = -32t + C$

$v(0) = -32(0) + C$

$v_0 = C$

$v(t) = -32t + v_0$

$s(t) = -16t^2 + v_0 t + C$

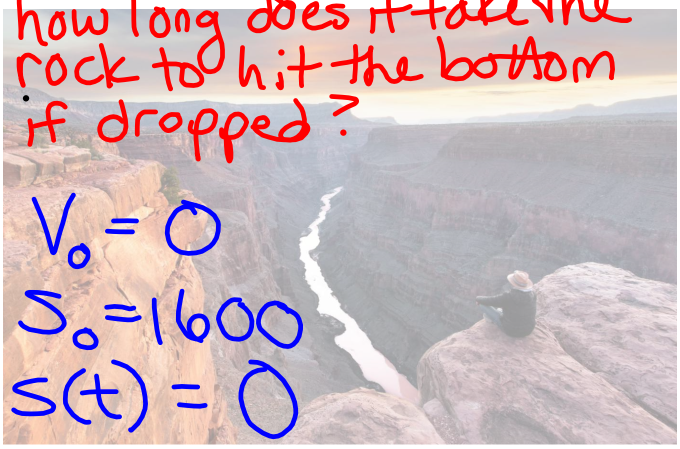
$s(0) = -16(0)^2 + v_0(0) + C$

$s_0 = C$

$$\boxed{s(t) = -16t^2 + v_0 t + s_0}$$

72. 1600 m Grand Canyon is deep

how long does it take the rock to hit the bottom if dropped?



$v_0 = 0$

$s_0 = 1600$

$s(t) = 0$

$a = -9.8 \text{ m/s}^2$

$v = -9.8t + v_0$

$s = -4.9t^2 + v_0 t + s_0$

$0 = -4.9t^2 + 1600$

$4.9t^2 = 1600$

$t^2 = \frac{1600}{4.9}$

$t = \sqrt{\frac{1600}{4.9}} = \boxed{18.07 \text{ s}}$

80. $a(t) = \cos t$, $t > 0$

@ $t = 0$; position is $x = 3$ $x(0) = 3$

$v(0) = 0$

a) find velocity & position functions

b) find value(s) of t for which the particle is at rest.

$v(t) = \sin t + C_1$

$0 = \sin(0) + C_1 \Rightarrow C_1 = 0$

$\boxed{v(t) = \sin t}$

$x(t) = -\cos t + C_2$

$3 = -\cos(0) + C_2$

$3 = -1 + C_2$

$4 = C_2$

$\boxed{x(t) = -\cos t + 4}$

$\sin t = 0$

$t = 0, \pi, 2\pi, \ldots \pi k$

4.2 Area

Sigma Notation

$$\sum_{i=1}^{n} a_i = a_1 + a_2 + \ldots + a_n$$

Summation Formulas

1. $\sum_{i=1}^{n} c = nc$

2. $\sum_{i=1}^{n} i = 1+2+3+\dots+n = \frac{n(n+1)}{2}$

3. $\sum_{i=1}^{n} i^2 = 1^2+2^2+3^2+\dots+n^2 = \frac{n(n+1)(2n+1)}{6}$

4. $\sum_{i=1}^{n} i^3 = 1^3+2^3+3^3+\dots+n^3 = \frac{n^2(n+1)^2}{4}$