

Day 4

Review Hodgepodge

1. Given $\frac{dy}{dx} = e^{3x}$ find the equation of the family of curves which pass through the point $(\ln 1, 0)$.

$$\int dy = \int e^{3x} dx \quad 0 = \frac{1}{3}e^{3(\ln 1)} + C$$

$$y = \frac{1}{3}e^{3x} + C \quad 0 = \frac{1}{3} + C \rightarrow C = -\frac{1}{3}$$

$$\boxed{y = \frac{1}{3}e^{3x} - \frac{1}{3}}$$

2. Integrate: $\int \frac{9dx}{\sqrt{4-x^2}} = 9 \int \frac{1}{\sqrt{2^2-x^2}} dx = \boxed{9\sin^{-1}(x/2) + C}$

3. Find the particular solution of the equation $f'(x) = 2x^{3/2}$ that satisfies the condition $f(1) = 6$.

$$f(x) = 4\sqrt{x} + C \quad 6 = 4\sqrt{1} + C$$

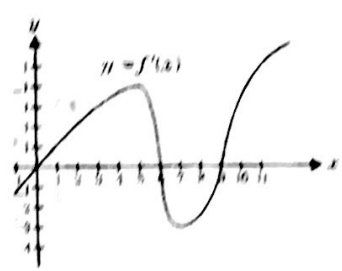
$$= 4x^{1/2} + C \quad 6 = 4 + C$$

$$C = 2$$

$$\boxed{f(x) = 4\sqrt{x} + 2}$$

4. The values of x where the graph as illustrated of $f(x)$ is concave downward

$x \in (5, 7)$



5. An object moves along the x -axis so that its velocity at anytime $t \geq 0$ is given by $v(t) = 4t^2 - 4t$. Find the total displacement of the particle from $t = 0$ to $t = 2$.

$$\int_0^2 (4t^2 - 4t) dt = \boxed{8}$$

6. Differentiate: $f(x) = x^2 + 2 \tan x$ $\boxed{f'(x) = 2x + 2 \sec^2 x}$

7. Evaluate: $\int \frac{6x+5}{3x^2+5x-2} dx = \boxed{\ln|3x^2+5x-2| + C}$

$$A = \quad B = \quad C =$$

$$\boxed{\frac{A}{x} + \frac{B}{x-1} + \frac{C}{x+3}}$$

8. Find the partial fractions for $\frac{4x^2+x-9}{x^3+2x^2-3x}$ (You do NOT have to integrate).

$$\rightarrow x(x^2+2x-3) = x(x-1)(x+3)$$

9. Given a function is defined by $f(x) = \frac{x}{x^2+1}$. Find all the relative maximum and/or relative minimum points.

$$f'(x) = \frac{(x^2+1) - x(2x)}{(x^2+1)^2} = \frac{-x^2+1}{(x^2+1)^2}$$

$$0 = -x^2+1 \quad 0 = (x^2-1)^2$$

$$x = \pm 1, \quad x = \pm 1$$

$$\boxed{\text{max: } (1, 1/2) \quad \text{min: } (-1, -1/2)}$$

10. Given $y = \arcsin(\tan x)$, then $\frac{dy}{dx} = \boxed{\frac{\sec^2 x}{1 - \tan^2 x}}$