

# MATH 141: Quiz 7

Name: key

Directions:

- \* Show your thought process (commonly said as "show your work") when solving each problem for full credit. **Remember to fully simplify.**
- \* If you do not know how to solve a problem, try your best and/or explain in English what you would do.
- \* Good luck!

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1. Given

$$f''(x) = 20x^3 + 12x^2 + 4, \quad f(0) = 8, \quad f(1) = 5$$

Find the function  $f(x)$ .

Use general antiderivatives.

$$\begin{aligned} f'(x) &= 20 \cdot \frac{x^4}{4} + 12 \frac{x^3}{3} + 4x + C \\ &= 5x^4 + 4x^3 + 4x + C \end{aligned}$$

$$\begin{aligned} f(x) &= 5 \frac{x^5}{5} + 4 \frac{x^4}{4} + 4 \frac{x^2}{2} + Cx + D \\ &= x^5 + x^4 + 2x^2 + Cx + D \end{aligned}$$

Use initial conditions to find  $C$  and  $D$

$$8 = f(0) = 0^5 + 0^4 + 2 \cdot 0^2 + C \cdot 0 + D$$

So  $D = 8$ . Substitute in.

$$5 = f(1) = 1^5 + 1^4 + 2 \cdot 1^2 + C \cdot 1 + 8$$

$$5 = 12 + C \rightarrow C = -7$$

$$f(x) = x^5 + x^4 + 2x^2 - 7x + 8$$

2. Integrate the following

$$(a) \int_{-2}^{21} 3 dx = 3x \Big|_{-2}^{21} = 3 \cdot 21 - 3 \cdot (-2) = \boxed{69}$$

↑  
1,21

$$(b) \int_1^3 (x+1) dx = \frac{x^2}{2} + x \Big|_1^3 = \frac{3^2}{2} + 3 - \left( \frac{1^2}{2} + 1 \right)$$
$$= \frac{9}{2} + 3 - \frac{3}{2}$$
$$= \boxed{6}$$

$$(c) \int_{-2}^2 (4x^3 - x^2 + 1) dx = 4 \frac{x^4}{4} - \frac{x^3}{3} + x \Big|_{-2}^2$$
$$= x^4 - \frac{x^3}{3} + x \Big|_{-2}^2$$
$$= 2^4 - \frac{2^3}{3} + 2 - \left( (-2)^4 - \frac{(-2)^3}{3} - 2 \right)$$
$$= 18 - \frac{8}{3} - \left( 14 + \frac{8}{3} \right)$$
$$= 4 - \frac{16}{3}$$
$$= \boxed{-\frac{4}{3}}$$

2