

Name: Key

Math 152 Calculus II - Crawford

Quiz 1

18 February 2020

Books, notes (in any form), and calculators are not allowed. *Show all your work.* Good Luck!

1. (3 pts) Differentiate the following. [Do not simplify.]

$$V(t) = \frac{4+3t}{te^{-t^2}}$$

$$V' = \frac{(te^{-t})(3) - (4+3t)(te^{-t^2} \cdot (-2t) + e^{-t^2} \cdot 1)}{(te^{-t^2})^2}$$

2. (3 pts) Integrate the following.

$$\int \frac{1}{e^{\pi x}} dx = \int e^{-\pi x} dx = \boxed{-\frac{1}{\pi} e^{-\pi x} + C}$$

using rule $\int e^{ax} dx = \frac{1}{a} e^{ax} + C$

OR

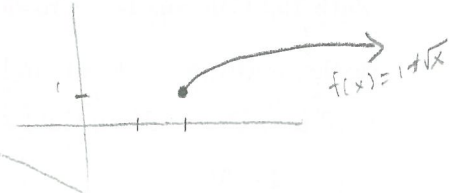
$$u = -\pi x$$
$$du = -\pi dx$$
$$-\frac{1}{\pi} du = dx$$

$$\Rightarrow \int e^{-\pi x} dx = -\frac{1}{\pi} \int e^u du = -\frac{1}{\pi} e^u + C$$
$$= -\frac{1}{\pi} e^{-\pi x} + C$$

5 3. (4.5 pts) Given $f(x) = 1 + \sqrt{x-2}$.

domain: $x-2 > 0 \Rightarrow x > 2$

range: $y \geq 1$
(see graph)



(a). Find $f^{-1}(x)$.

$$y = 1 + \sqrt{x-2}$$

$$x = 1 + \sqrt{y-2}$$

$$x-1 = \sqrt{y-2}$$

$$(x-1)^2 = y-2$$

$$y = (x-1)^2 + 2 \Rightarrow$$

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

w/ domain given below

(b). State the domain and range of f^{-1} .

$$\text{dom}(f^{-1}): x \geq 1$$

$$\text{range}(f^{-1}): y > 2$$

← Interchanged

5 4. (4.5 pts) Given $f(x) = x^3 + 2x - 1$, find $(f^{-1})'(2)$ using the formula $(f^{-1})'(a) = \frac{1}{f'(f^{-1}(a))}$.

Do not try to find f^{-1} !

$$(f^{-1})'(2) = \frac{1}{f'(f^{-1}(2))} = \frac{1}{f'(1)} = \boxed{\frac{1}{5}}$$

① $f^{-1}(2) = ? \Rightarrow f(?) = 2$

$$x^3 + 2x - 1 = 2$$

$x=1$ by observation

$$f(1) = 2 \Leftrightarrow f^{-1}(2) = 1$$

② $f'(x) = 3x^2 + 2$
 $f'(1) = 3 + 2 = 5$