Name: Solutions _____ / **25**

Please circle your instructor's name: James Gossell Gordon Williams

There are 25 points possible on this quiz. Any outside materials are not allowed. **For full credit, show all work clearly.**

1. **[12 points]** Find $f'(x)$ for each function below. You may use any method you like, and you do not need to simplify your answer.

   a. $f(x) = 4\tan(x) + 5\csc(x)$

   $f'(x) = 4\sec^2(x) - 5\csc(x)\cot(x)$

   b. $f(x) = x^2\sec(x) + \cos(\pi)$

   $f'(x) = 2x\sec(x) + x^2\sec(x)\tan(x)$

   c. $f(x) = \dfrac{\cot(x)}{x^5 - x}$

   $f'(x) = \dfrac{-\csc^2(x)(x^5-x) - \cot(x)(5x^4-1)}{(x^5-x)^2}$

   d. $f(x) = (x^2 + \sin(x))^{\frac{1}{3}}$

   $f'(x) = \frac{1}{3}(x^2+\sin(x))^{-2/3} \cdot (2x + \cos(x))$

2. [6 points]

The **height** of a person riding a Ferris wheel is given by the function:

$$h(t) = 16 - 15\cos\left(\frac{\pi t}{20}\right),$$

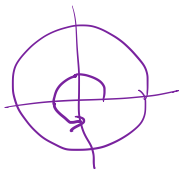
where t is measured in seconds and $h(t)$ is measured in meters.

a. Find the vertical velocity function $(h'(t))$ of the rider.

$h'(t) = 15\sin\left(\frac{\pi t}{20}\right)\cdot\frac{\pi}{20} = \frac{3}{4}\pi\sin\left(\frac{\pi t}{20}\right)$ m/s

b. Using your answer from part (a), determine whether the rider is moving upward or downward 30 seconds into the ride. Justify your answer.

$h'(30) = \frac{3\pi}{4}\sin\left(\frac{\pi\cdot 30}{20}\right) = \frac{3\pi}{4}\sin\left(\frac{3}{2}\pi\right) = -\frac{3\pi}{4} < 0$



So going down.

3. [7 points]

Let $g(x) = \left(3x^2 - 12x\right)^5$.

a. Find $g'(x)$ using the chain rule.

$g'(x) = 5\left(3x^2 - 12x\right)^4 \cdot (6x - 12)$

b. Using your answer from part (a), determine the x-values for which $g(x)$ has a **horizontal tangent line**.

Want $g'(x) = 0$ or $5(3x^2-12x)^4\cdot(6x-12) = 0$

so $3x^2 - 12x = 0$ or $6x - 12 = 0$

so $3x(x-4) = 0$ or $6(x-2) = 0$

So $g'(x) = 0$ when $x = 0, 2$ or 4.