Midterm 1 Review Problems **Math 141**

These are suggested review problems similar to what might be on Midterm 1. Included with each problem is a link to a video where you can see how the problem is solved. I didn't make the videos, they are all available on YouTube.

1. Find the value of a that makes the function $f(x) = \begin{cases} 8x^2, & x \geq 1 \\ ax - 5, & x < 1 \end{cases}$ continuous.

https://youtu.be/9QEZ2pMOjwE

2. A particle has position $s(t) = -2t^3 + 13t^2$ where s is measured in meters and t is measured in seconds.
   (a) Find the average velocity from $t = 4$ to $t = 6$.
   (b) Find the instantaneous velocity at $t = 4$.

https://youtu.be/HJKNGIlKIaU

3. Find the x-values where $f(x) = \dfrac{x-2}{x^2-4}$ has a discontinuity, and classify each discontinuity by type (jump, hole, pole).

https://youtu.be/fWYmFpWzGTs

4. Use the definition of derivative $f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$ to find the derivative of $f(x) = 2x + 3$.

https://youtu.be/OVlkHTXsDms

5. Find the equation of the tangent line to the function $y = x^3 + 4x - 6$ at the point $(2, 10)$.

https://youtu.be/_QdoYQdQ1Ys

6. Find the derivative of $y = -5x^{3/4} - 5x^{1/4}$.

https://youtu.be/Nc962-3dZdo

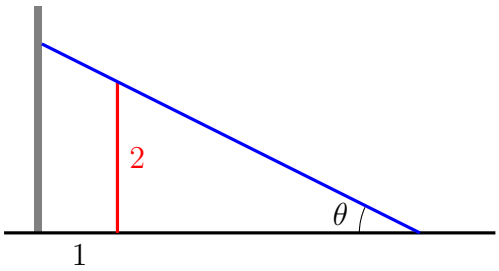
7. Find the values of x where $f(x) = x^4 - 8x^2 + 6$ has a horizontal tangent line.

https://youtu.be/KqtzsLt80q8?t=39

8. Find all solutions of the equation $2\sin^2 x = 1 + \cos x$ on the interval $[0, 2\pi)$.

https://youtu.be/_gX1LOYpR8o

9. A ladder is positioned on the ground so that it leans against a vertical wall, and just clears a 2 meter tall fence that is one meter away from the wall (see picture). Find a formula for the length of the ladder as a function of the angle it makes with the ground.

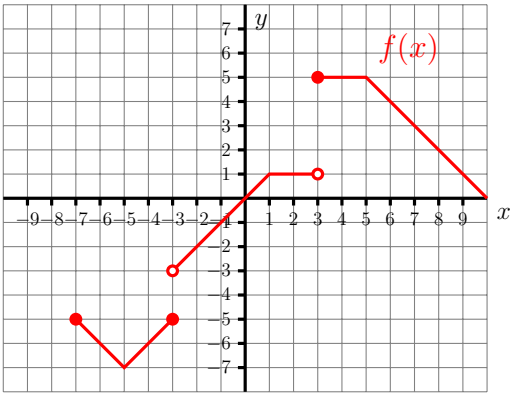


https://youtu.be/HdgZP3sfwuI

10. Simplify $\dfrac{1 + \cot^2(x)}{\csc^2(x) - 1}$.

https://youtu.be/Z2buWFvEE7Y

11. Use the graph below to find the indicated limits.



(a) $\lim_{x\to 3^+} f(x)$

(b) $\lim_{x\to 3^-} f(x)$

(c) $\lim_{x\to 3} f(x)$

(d) $\lim_{x\to (-7)^+} f(x)$

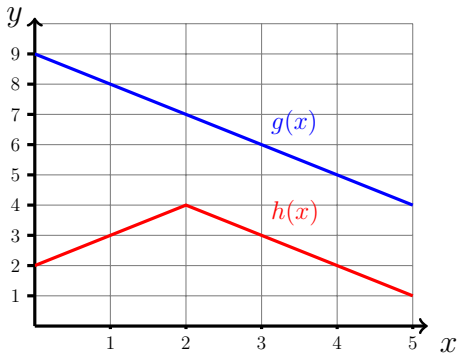
(e) $\lim_{x\to (-7)^-} f(x)$

https://youtu.be/qxhxp9IIEVo

12. Find $\lim_{x \to -1} \left(\dfrac{2x+2}{x+1} \right)$.

https://youtu.be/GGQngIp0YGI

13. Let g and h be the functions in the graphs shown below. If $f(x) = g(x)h(x)$, then find $f'(4)$.

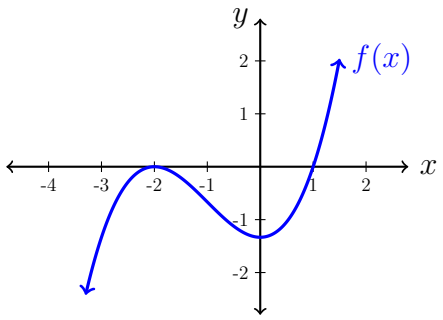


https://youtu.be/1cHPPlmIzk0

14. Find the derivative of $f(x) = \dfrac{x^2}{\cos x}$.

https://youtu.be/WqzY3xibFL8

15. Draw a rough sketch of the graph of the derivative of the function shown in the graph below.



https://youtu.be/Kz_reJgi_Rg