

*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.

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<https://youtu.be/9QEZ2pM0jwE>

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  $t = 4$ .

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<https://youtu.be/HJKNIGI1KIaU>

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

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<https://youtu.be/fWYmFpWzGTs>

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

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<https://youtu.be/OVlkHTXsDms>

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

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[https://youtu.be/\\_QdoYQdQ1Ys](https://youtu.be/_QdoYQdQ1Ys)

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

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

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

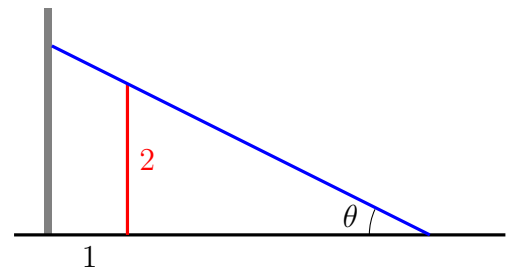
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<https://youtu.be/KqtzsLt80q8?t=39>

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

[https://youtu.be/\\_gX1LOypR8o](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.

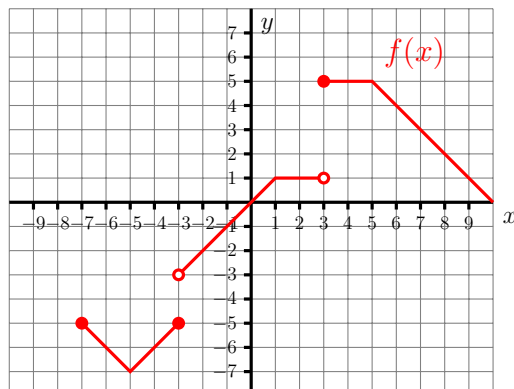


<https://youtu.be/HdgZP3sfwuI>

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

<https://youtu.be/Z2buWFvEE7Y>

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



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

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

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

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

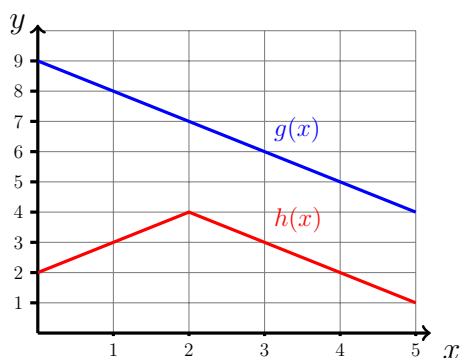
(e)  $\lim_{x \rightarrow (-7)^-} f(x)$

<https://youtu.be/qxhxp9IIEVo>

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

<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  $f'(4)$ .

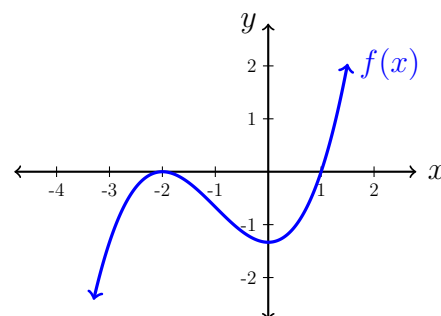


<https://youtu.be/1cHPP1mIzk0>

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

<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](https://youtu.be/Kz_reJgi_Rg)