

Midterm 2 Review Problems

Math 140

These are suggested review problems similar to what might be on Midterm 2. 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 online.

1. Solve $x^2 + 2x - 24 > 0$.

<https://youtu.be/E9UsqBX1BPw>

2. Solve $2x^3 - 98x \leq 0$.

<https://youtu.be/E9UsqBX1BPw?t=282>

3. Solve $\frac{1}{x-2} > \frac{-1}{x^2 - 7x + 10}$.

<https://youtu.be/E9UsqBX1BPw?t=517>

4. Evaluate $\lim_{x \rightarrow 2} \frac{4}{x+1}$.

<https://youtu.be/pxyr17D8ZyI>

5. Evaluate $\lim_{x \rightarrow 4} \frac{x^2 + x - 20}{x - 4}$.

<https://youtu.be/7RaNdejw6yE>

6. Find $\lim_{x \rightarrow 5^-} \frac{3}{x-5}$.

<https://youtu.be/bVORTtywt4g>

7. Find the derivative of $y = \frac{2}{x^3}$.

https://youtu.be/ETL_-_Vj_A0

8. Let $f(x) = \sqrt[3]{x}$. Find $f'(x)$.

<https://youtu.be/H-v4oraDjuM?t=73>

9. Find the derivative of $f(x) = \frac{5x+2}{3x-4}$.

<https://youtu.be/BF4e2vbmGkk>

10. Calculate $\frac{d}{dx}(x^2 - 2)(7x^3 + 5)$.

<https://youtu.be/8Qw2aPjqW9c>

11. Find $\frac{d}{dx}\sqrt{3x^2 - x}$.

<https://youtu.be/IiBC4ngwH6E>

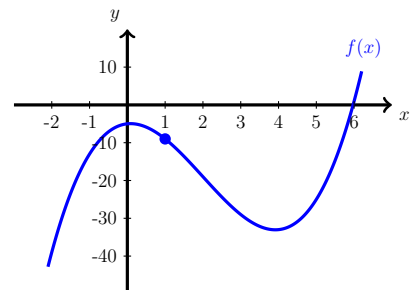
12. Suppose that the total cost for a company to produce x machines is $C(x) = 1100 + 140x - 0.2x^2$. Find the marginal cost $C'(x)$ when 105 machines are produced.

<https://youtu.be/RNOBTZ46Knk>

13. Where does the function $f(x) = x^3 - 6x^2 + 15$ have a horizontal tangent line?

<https://youtu.be/aNfoxbMUOHk>

14. Let $f(x) = x^3 - 6x^2 + x - 5$. Find the equation of the tangent line to $f(x)$ when $x = 1$.



<https://youtu.be/j9FDoYNxZlw>

15. Suppose the profit for a bicycle manufacturer is $P(x) = 0.0002x^3 + 10x$ where x is the number of bicycles they sell. Find the derivative $P'(x)$ and use it to estimate the marginal profit when $x = 100$.

<https://youtu.be/IB-2Umkiok8>

16. Find the intervals where $f(x) = 2 + 3x^2 - x^3$ is concave up and the intervals where it is concave down. Also, find the inflection points of $f(x)$.

<https://youtu.be/c1N8zyVhWxM>

17. Find the intervals where $h(x) = (x^2 - 1)^3$ is concave up and the intervals where it is concave down.

<https://youtu.be/c1N8zyVhWxM?t=183>

18. The kinetic energy of an object is $E = \frac{1}{2}mv^2$ where m is its mass and v is its velocity. Suppose that a rock has a mass of 2 kilograms and is falling so that its velocity is increasing at a rate of 9 meters per second every second (i.e., $\frac{dv}{dt} = 9$). Use the chain rule to find the rate of change in the rock's kinetic energy with respect to time at that instant.

<https://youtu.be/NA-Ri4LJPaY>