Office Hours:

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Review: Meaning of Derivatives

1. Find the equation of the tangent line to $y = x^3 - 5x$ at $x = 2$.

(A) $y = 2x - 6$ (B) $y = 16x - 7$ (C) $y = 7x + 16$ (D) $y = 7x - 16$

Answer: D
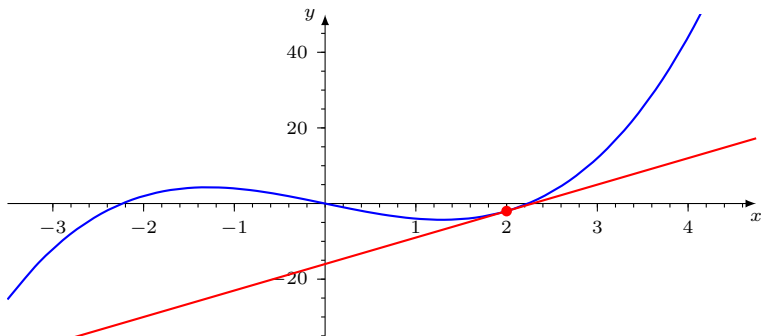
Review: Meaning of Derivatives 2

2. Where is $f(x) = 3x^2 + 12x - 4$ decreasing?

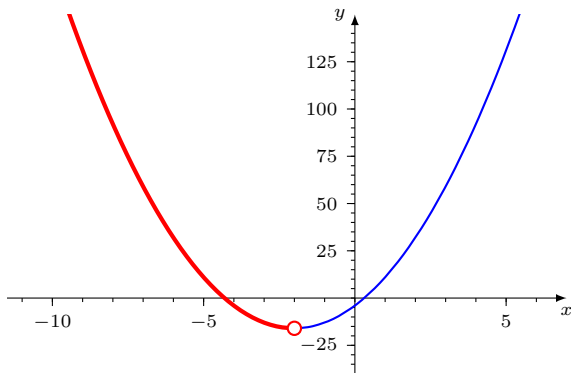(A) $x < -2$ (B) $x > -2$ (C) $x < 2$ (D) $x > 2$ (E) $x = 2$

Answer: A

Review: Meaning of Derivatives 3

3. Where is $f(x) = x^3 + 12x^2 + 6x + 18$ concave up?
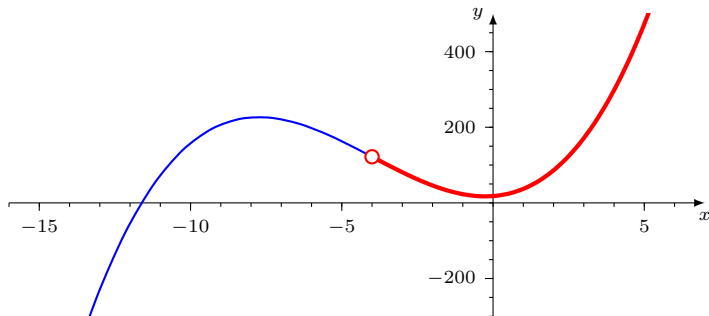
(A) $x < -4$ (B) $x > -4$ (C) $x > -2$ (D) $x < -2$ B

Review: Derivatives

4. Suppose

$$f(x) = 2x^4 - 3x^2 + 5x + 3$$

Click as you compute the following:

(A) $f'(x) = 8x^3 - 6x + 5$

(B) $f''(x) = 24x^2 - 6$

(C) $f'''(x) = 48x$

(D) $\dfrac{d^4 f}{dx^4} = 48$

5. Find the minimum of $f(x) = 2x^2 + 8x + 3$

(A) -5 (B) -2 (C) 0 (D) 2 (E) 5 A

Derivatives (cont'd)

6. Suppose $f(x) = x^2 - 4x + 5$. Click as you do the following:

(A) What is the slope of the graph when $x = 3$? $f'(3) = 2$

(B) What is the equation of the tangent line to the graph $y = f(x)$ at $x = 3$? $y = 2x - 4$

(C) Is the graph concave up or concave down? $f''(x) = 2 > 0$; concave up

Hint: Draw a picture!

How many did you get?

(A) 3 (B) 2 (C) 1 (D) 0 (E) Don't press this button!

Click as you go: Objects in Motion

7. A gorilla standing on top of Campbell Hall and throws a banana at a monkey on top of Cheadle Hall 100 meters away.

- $h(t) = 35 + 50t - 5t^2$ meters is the height of the banana t seconds after it is thrown
- Banana lands at the monkey's feet 6 seconds after it is thrown

(A) Draw a diagram showing Campbell Hall, Cheadle Hall, and the flight path of the banana.

(B) How high is Cheadle Hall? $h(6) = 155$ m

(C) How high above ground did the banana fly? $h(5) = 160$ m

(D) How high above Cheadle Hall did the banana fly?   5 m

(E) For how many seconds of the flight was the banana gaining height?   until $h'(t) = 0$; until $t = 5$ seconds

(A) How fast was the banana going when it landed? $|h'(6)| = 10$ m/s

Review: Lines!

8. Find the equation of the line with slope 3 that contains the point $(2, 5)$.

(A) $y = 3x + 5$ (B) $y = 3x - 1$ (C) $y = 3x + 2$ B

9. What is the x-coordinate of the point where the two lines

$$y = 3x + 2 \qquad \text{and} \qquad y - 4x + 1 = 0$$

cross?

(A) $x = -3$ (B) $x = -1$ (C) $x = 1$ (D) $x = 3$ (E) $x = 4$

Answer: D

Review: Logs!

10. Solve $3^x = 7$.

(A) $x = 7/3$ (B) $x = \log(7/3)$

(C) $x = \log(7)/\log(3)$ (D) $x = \log(7) - \log(3)$ C

Review: Logs! (continued)

Remember half-life:

- Half-life $= K$ years

- Initial amount $= A$

- Amount after t years is $\boxed{= A \times 2^{-t/K}}$

11. Let's start with 8 grams of an element with half-life of 5 years.

(a) How many grams remain after 10 years?

(A) 0   (B) 2   (C) 4   (D) 8 $\boxed{B}$

(b) How many years until 3 grams remain?

(A) $8/3$ (B) $-5\log(3/8)/\log(2)$

(C) $-5\log(3/16)$ (D) $\log(3/8) - \log(2)$ $\boxed{B}$