Name: _____

CLASSWORK 110

Find the antiderivative of each function.

1. $y = 4\sqrt[5]{x^4}$

2. $y = (x^5 + x + 1)\sqrt{x^6 + 3x^2 + 6x}$

3. $y = (4x^2 + \cos x)^3(8x - \sin x)$

4. $y = (5x^3 \cos x)^2 (15x^2 \cos x - 5x^3 \sin x)$

Picking up where we left off yesterday...

5. The **velocity** of an object over time is described by the equation $y = -.3x^2 + 4x - 7$, where y represents velocity in meters per second and x represents time in seconds.

a) Find the object's velocity at t = 3 seconds and at t = 5 seconds.

$-.3(3)^2 + 4(3) - 7 = 2.3$ m/s $\qquad -.3(5)^2 + 4(5) - 7 = 5.5$ m/s

b) Find the **average acceleration** between t = 3 and t = 5.

$\Delta v/\Delta t = (3.2 \text{ m/s})/(2 \text{ s}) = 1.6$ m/s/s

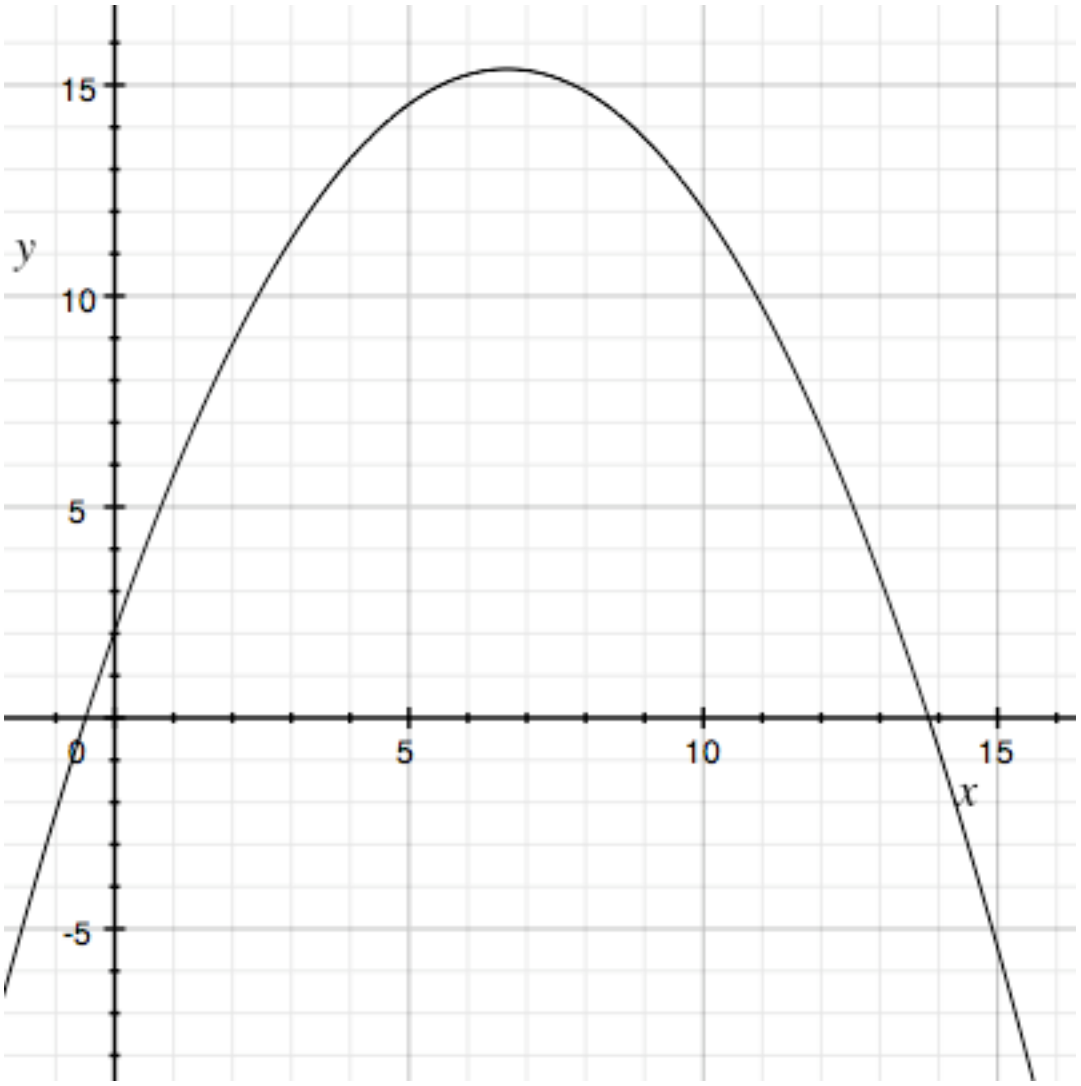
c) Illustrate what you just did on the graph on the next page. Why is this not the **exact** acceleration at t = 3?

Velocity is constantly changing.

d) Calculate the average acceleration between t = 3 and t = 3.1.

$-.3(3.1)^2 + 4(3.1) - 7 = 2.517$ m/s $\qquad \Delta v/\Delta t = (.217 \text{ m/s})/(.1 \text{ s}) = 2.17$ m/s/s

e) Calculate the exact, instantaneous rate of acceleration at t = 3.



f) If the object kept going at the speed it had at t = 3, how far would it travel between t = 3 s and t = 5 s?

g) Why does (f) **not** give the exact answer for how far the object has travelled?

h) If the object's velocity at t = 3 was imagined to be constant for at least .01 seconds, how far would we estimate that the object travelled between t = 3 and t = 3.01?

i) Does letter (h) give a good approximation of the actual distance travelled? Explain.

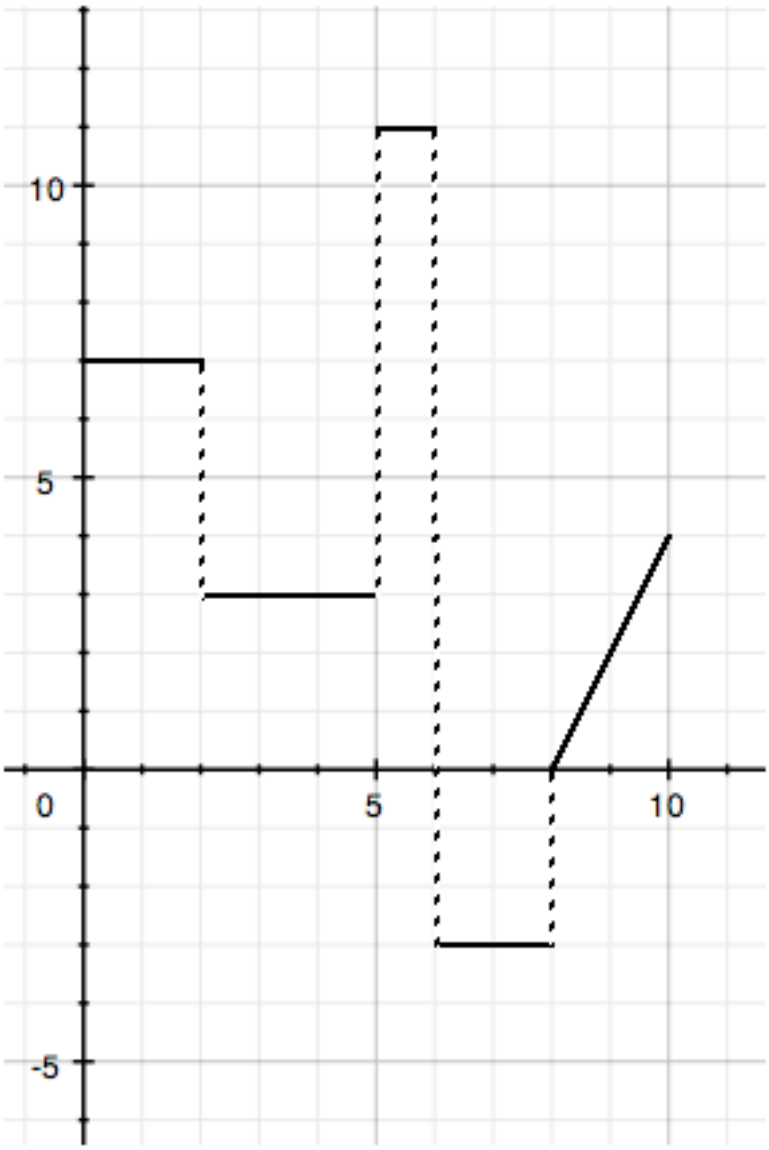
j) Label the graph to show **geometrically** what you calculated in part (f) and in part (h).

k) Find an equation for the object's position over time.

l) Calculate the **exact** displacement between t = 3 and t = 5.

m) Calculate the exact displacement between t = 3 and t = 3.01 .

6. A velocity-time graph is shown below. Calculate the total distance travelled by the object over the entire interval of time between t = 0 and t = 10.



Does this graph portray realistic movement? (would a real object move like this?) Explain.

Can we know where the object started?

Do we know the actual position of the object or just *how much it has moved?*

7. Lily decides that she is not making enough money teaching, so instead she starts working as a waitress at the Awesome Mathematics Restaurant. Her tips at the restaurant are constantly fluctuating depending on the time of day. In fact, the rate at which she is making tips varies according to the equation

$m = \sin t + 5$

where m is her rate of dollars per hour and t is time in hours.

a) How much is Lily making in tips, per hour, at t = 2 pm?

b) If Lily's tips were constant, how much money would she make between 2 pm and 3 pm?

c) Why isn't this the actual amount of money she made?

d) Calculate the actual amount of tips she earns between 2 pm and 3 pm.