2014 AB/BC #1
(calculator active)

Amount of grass clippings remaining in a bin is $A(t) = 6.687(0.931)^t$ for $0 \le t \le 30$

(a) Average rate of change of $A(t)$ on that interval is

$$\frac{1}{30-0}\int_0^{30} A'(t)\,dt = \frac{1}{30}\left(A(30)-A(0)\right) \approx \boxed{-0.1968024044\,\frac{\text{lb}}{\text{day}}} \quad -0.197\,\frac{\text{lb}}{\text{day}}$$

(b) Using your calculator, $A'(15) \approx \boxed{-0.1635905805}$ -0.164

This means that the grass clippings are decomposing at a rate of $0.164\,\frac{\text{lb}}{\text{day}}$ on day 15.

(c) Find t when $A(t) = \frac{1}{30-0}\int_0^{30} A(t)\,dt \Rightarrow t \approx \boxed{12.414774 \text{ days}}$ 12.415 days

Solve this with your calculator. One way is to get the expression equal to 0 and enter it in your calculator as Y_1 and find the zeros between 0 and 30.

(d) Tangent line approximation (linearization) for $A(t)$ when $t > 30$.

$y - y_1 = f'(x)(x - x_1)$ becomes $A(t) - A(30) = A'(30)(t-30)$

or $A(t) = A(30) + A'(30)(t-30)$

Now, find t when $A(30) = 0.5$

$A(t) = 0.5 + A'(30)(t-30) \Rightarrow$ Set equal to 0 and solve: $0.5 + A'(30)(t-30) - A(t) = 0$

$t \approx \boxed{35.05443 \text{ days}}$ 35.054 days