Quiz 1 (20 points) Key
Name:
Section: 201/202 (circle one)

1. A biologist is growing mold in a Petri dish for an experiment. At noon she starts the experiment by innoculating (putting mold into) the dish. At 4 pm, she notices that the mold has grown to cover an area of 5 cm^2. At 7pm, she returns and finds the mold now covers an area of 7 cm^2. ~~Let $f(t)$ be the area of the mold, in cm^2, in the Petri dish t hours after noon.~~

(a) Assuming the area of the mold grows linearly over time, find a formula $l(t)$ which gives the area the mold covers t hours after noon. (3 points).

(4, 5) (7, 7)

$y = l(t) = mt + b$

$7 = 7m + b$

$-\ 5 = 4m + b$

$2 = 3m$

$m = \frac{2}{3}$

$7 = 7(\frac{2}{3}) + b$

$7 = 14/3 + b$

$\frac{7}{3} = b$

$l(t) = \frac{2}{3}(t) + \frac{7}{3}$

$\approx .66t + 2.33$

V: $5 \stackrel{?}{=} 4(\frac{2}{3}) + \frac{7}{3}$

$5 \stackrel{?}{=} \frac{8}{3} + \frac{7}{3}$ ✓

(b) Assuming the area of the mold grows exponentially over time, find a formula $e(t)$ which gives the area the mold covers t hours after noon. (3 points).

$y = e(t) = y_0 a^t$

$7 = y_0 a^7$

$\div\ 5 = y_0 a^4$

$1.4 = a^3$

$a = \sqrt[3]{1.4}$

$a = 1.1187$

$7 = y_0 (1.1187)^7$

$7 = y_0 (2.193)$

$y_0 = 3.1925$

$e(t) = 3.1925 (1.1187)^t$

V: $5 \stackrel{?}{=} (3.1925)(1.1187)^4$

$5 \stackrel{?}{=} (3.1925)(1.566)$ ✓

(c) Using your formula $e(t)$ from part (b), how long does it take for the area of the mold to triple? (3 points).

$3y_0 = y_0 (1.1187)^t$

$3 = (1.1187)^t$

$\ln(3) = \ln(1.1187^t)$

$\ln(3) = t \cdot \ln(1.1187)$

$t = \frac{\ln(3)}{\ln(1.1187)}$

$t \approx 9.795$ hrs

(d) Suppose the biologist returns at 9pm to find the mold has grown to 8.8 cm^2. Which of your formulas more accuately predicts this growth? Justify your reasoning. (3 points). accurate

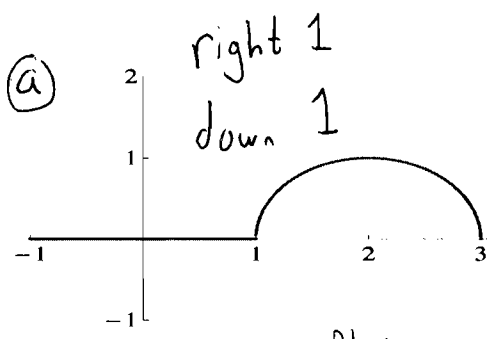
$l(9) = \frac{2}{3}(9) + 2.33 = 8.33$

$e(9) = 3.1925 (1.1187)^9$

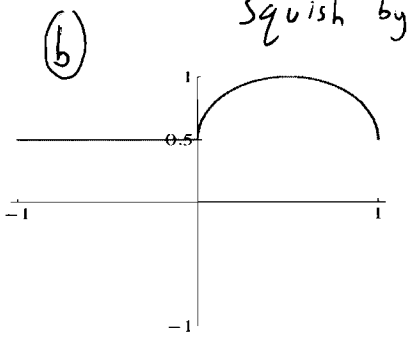
$= 3.1925 (2.744)$

$= 8.76$

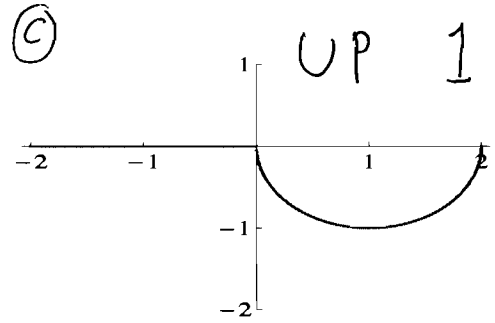
exponential is more ~~accurate~~ because it predicts 8.76 cm^2 of mold, which is closer than the 8.33 cm^2 of mold predicted by $l(t)$



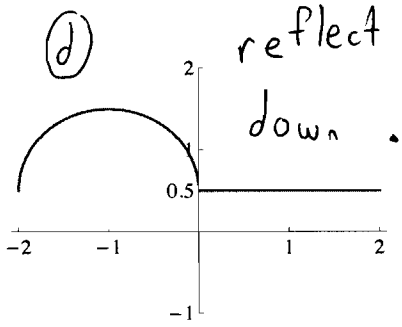
(a) reflect over x-axis



(b)

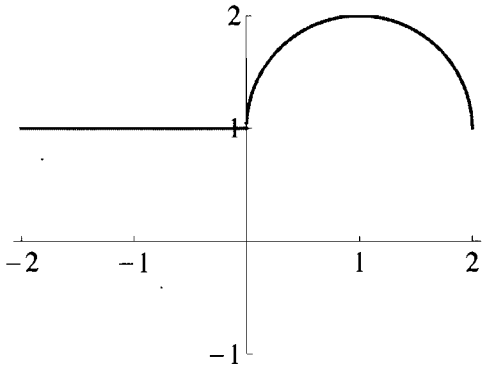


(c)



(d)

2. Given below is the graph of $y = f(x)$.



Find the function for the above graphs in terms of $f(x)$. (No partial credit, 8 points)

Write your answer here

(a) [redacted] $f(x-1)-1$

(b) [redacted] $f(2x)/2$

(c) $-f(x)+1$

(d) $f(-x)-.5$