Math 150 - Week-In-Review 7

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Exam 2 Review

1. The number of bacteria y in a culture after t days is given by the function $y(t) = 100e^{t/8}$.
   (a) What is the initial number of bacteria in the culture?

   (b) After how many days will there be 4000 bacteria?

2. The sound intensity level L (in decibels, dB), is related to the intensity of the sound I (in watts per square meter), by the equation $L = 10 \log \left(\dfrac{I}{I_0} \right)$, where $I_0 = 1 \times 10^{-12}\ W/m^2$ is the threshold of human hearing. Determine the intensity I of a sound that registers $L = 85\ dB$.

3. If you invest \$2000 in an account with an annual interest rate of 4%, compounded annually, find the time it takes for an investment of \$2000 to grow to \$3000.

4. A population of rabbits can be modeled using the logistic equation

$$N(t) = \frac{1000}{1 - 24e^{-0.18t}}$$

How long does it take for population of rabbits to grow to 4200?

5. A cup of coffee cools from 80°C to 70°C in 5 minutes. If the room temperature is 25°C, what will be the temperature of the coffee after 15 minutes?

6. Solve for for x using the techniques discussed in class.

(a) $\sqrt{x^4 + 9} = \sqrt{6}\, x$

(b) $\log_5(10 - x) - \log_5(x + 4) = 1$

(c) $\ln(2x+4)=5$

(d) $\dfrac{15}{100-e^{2x}}=3$

(e) $9 \cdot 3^{x^2-1} = 27^x$

(f) $e^{2x} + 7e^x - 18 = 0$

(g) $\log_5(4x) = 3$

(h) $\log_3(x-1) + \log_3(x+4) = 0$

(i) $\dfrac{2}{x-1} - \dfrac{5}{x+2} = \dfrac{10}{x^2+x-2}$

(j) $\sqrt[5]{x-2} - 1 = 0$

(k) $\left|\dfrac{3x}{x^2-9}\right| = \left|\dfrac{1}{x-3}\right|$

(l) $16 = \dfrac{2^{3x-5}}{4^{2x+1}}$

7. Use properties of logarithms to write the following as a single logarithm.

(a) $2\left(\log_5(x) + 2\log_5(y) - 3\log_5(z)\right)$

(b) $\dfrac{1}{3}\log(x+2)^3 + \dfrac{1}{2}\left(\log(x)^4 - \log(x^2 - x - 6)^2\right)$

8. Find the intervals where the inequalities are true.

(a) $\dfrac{2x^2+5x-3}{x+1} \geq 0$

(b) $(2x-9)(11-x)^6(x+4)^3 < 0$

(c) $2x\,(2x-3)^{-2} \leq 4\,(2x-3)^{-3}$

(d) $t\sqrt{t+1} \geq 5t$

9. Rewrite (expand) the following logarithmic expressions as a sum and/or difference of logarithms with linear arguments.

   (a) $\log\left(\dfrac{10x}{(x+17)^2(x-9)}\right)$

(b) $\ln\left(\dfrac{x^5 \cdot (y+1)^{-2}}{a^{-3} \cdot (p-2)^4}\right)$

(c) $\log_2\left(\sqrt[3]{\dfrac{x^2}{x^2 - 8x - 20}}\right)$

10. State domain of the following functions.

(a) $h(t) = 5^{\frac{3x+5}{x+1}}$

(b) $h(x) = \dfrac{\sqrt[4]{5x+1}}{\sqrt{e^x - 1}}$.

(c) $f(x) = \log_{11}(a - x) + 4x^2$

(d) $f(x) = \log\left(\dfrac{9-3x}{x+4}\right)$

(e) $f(x) = \dfrac{\sqrt{5-x}+e^{3x}}{\log_3(x+2)}$

11. Given $f(t) = -5(1+t)^{\frac{3}{2}} + 2$, evaluate the following.

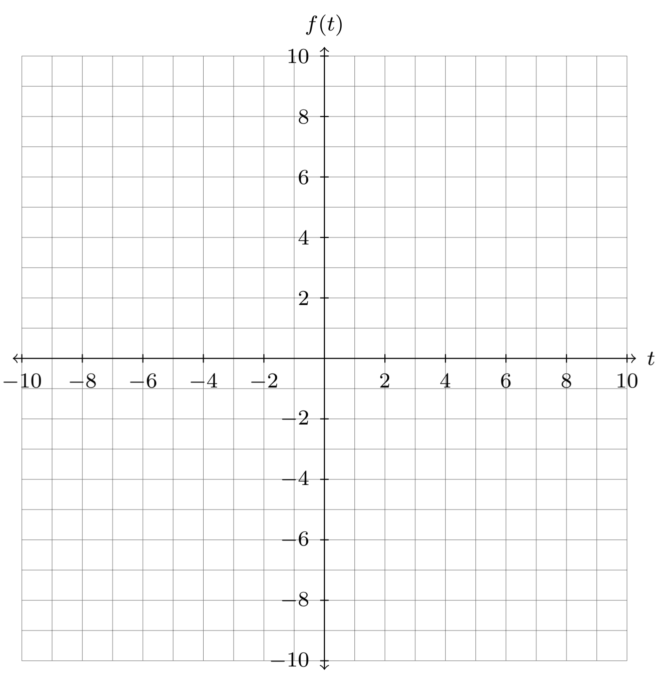
Domain: ____________________

Vertical asymptote(s): ____________________

End behavior: ____________________

Horizontal asymptotes: ____________________

Intercept(s): ____________________



12. Given the function $f(x) = \dfrac{(x+4)(2x+1)}{(2x+1)(x-5)}$, evaluate the following.

Domain: ____________________

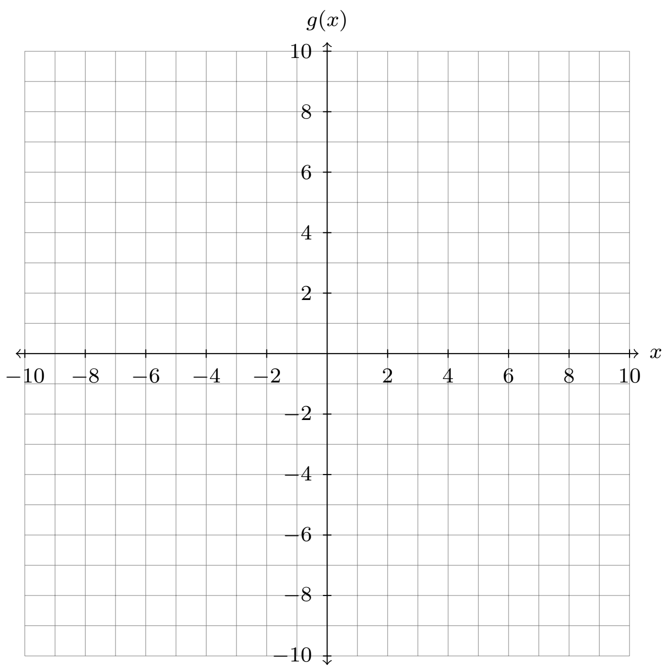
Hole(s): ____________________

Vertical asymptote(s): ____________________

End behavior: ____

Horizontal asymptotes: ____________________

Intercept(s): ____________________



13. Given $g(x) = 2\left(e\right)^{8-2x} + 5$, evaluate the following.

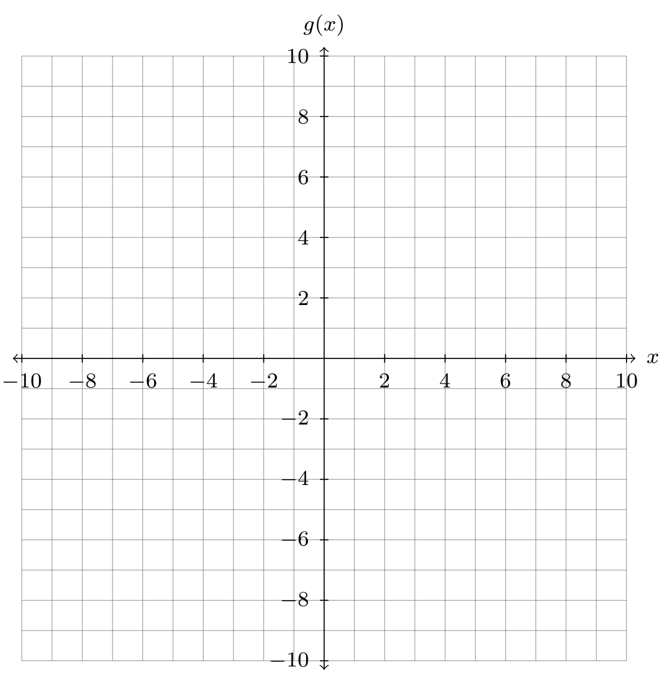
Domain: ____________________

Vertical asymptote(s): ____________________

End behavior: ____

Horizontal asymptotes: ____________________

Intercept(s): ____________________



14. Given $h(x) = -\log_3(4 - 2x) + 2$, evaluate the following.

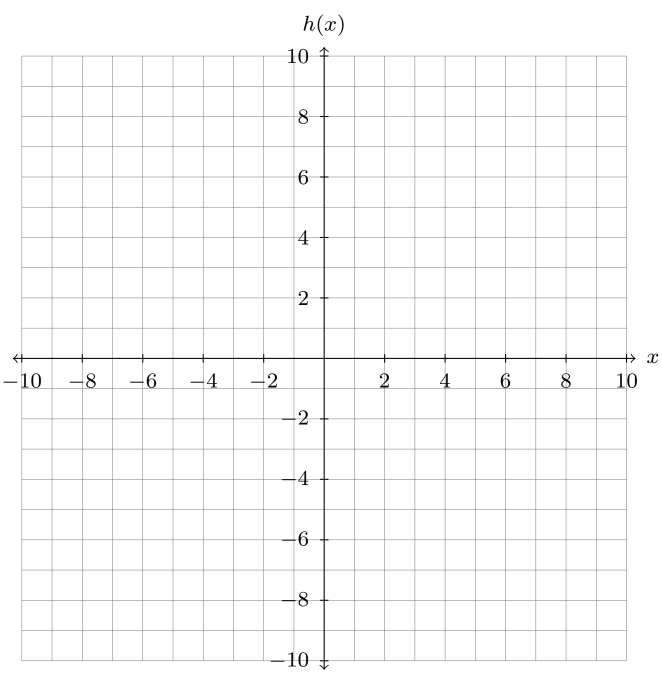
Domain: ____________________

Vertical asymptote(s): ____________________

End behavior: ____________________

Horizontal asymptotes: ____________________

Intercept(s): ____________________



15. Compute and completely simplify the difference quotient for $f(x) = \sqrt{1-5x}$ using the techniques discussed in class.

16. Compute and completely simplify the difference quotient for $g(x) = \dfrac{2}{1-x^2}$ using the techniques discussed in class.

17. simplify the following

(a) $(2^5)^{\log_2(3)}$

(b) $\log_{2^3}(2^8)$