

Math 131 Exam 1 Review Key

1 a) $[-10, 10]$ b) $(-10, 10)$

c) $(-\infty, -3] \cup [3, \infty)$ d) $(-2, \infty)$

e) $(-\infty, 0) \cup (0, \infty)$ f) $(-\infty, \infty)$

g) $(-\infty, 1] \cup [2, \infty)$

2.
$$f(x) = \begin{cases} .15x & 0 \leq x \leq 20,000 \\ .2x - 500 & 20,000 < x \end{cases}$$

3. $f(x) = -2(x+3)^2 + 12$

4. $f(x) = 3 \ln(x-2) + 7$

5. $f(x) = 3 + 5e^{x \ln \frac{7}{15}} = 3 + 5\left(\frac{7}{15}\right)^x$

6. $N(t) = 100(2.5)^{t/2}$

7. $g(x) = x^2 - 2x + 1$ $f(x) = x^{1/3}$

or $g(x) = x - 1$ $f(x) = x^{2/3}$

8. a) $a = 999.9863174$ $b = 1.056548749$
 ab^x

Rounding $A(t) = 1000(1.05655)^t$
 $= 1000e^{t \ln(1.05655)}$

$r = \ln(1.05655)$
 $\approx .055$

$P \sim 1000$ already estimated.

b) $\frac{\ln 2}{r} \approx 12.6$ years $\frac{\ln 3}{r} \approx 20$ yrs

c) A linear model.

d) A logarithmic model

9. a) $e^{2x} = (e^x)^2$

$$e^{2x} + 2e^x + 1 = (e^x + 1)^2 = 16$$

$$e^x + 1 = 4 \quad (\text{it cannot be } -4)$$

$$e^x = 3 \quad \boxed{x = \ln 3}$$

b) Factor $u^2 - 3u + 2 = 0$

$$(u-2)(u-1) = 0$$

$$u = 2 \text{ or } u = 1$$

Let $u = e^x$:

$$e^x = 2 \text{ or } e^x = 1$$

$$\boxed{x = \ln 2} \text{ or } \boxed{x = 0}$$

10. a) $\frac{1}{8}$ b) 116 c) 5 d) 5 or -5

e) $\frac{7}{3}$

11. a) Both are 8 ft/sec

b) $v_{avg} = 18$ ft/sec $v_{inst}(1) = 28$ ft/sec

c) $v_{avg} = \frac{1-\sqrt{3}}{2}$ ft/sec $v_{inst}(1) = -\frac{1}{2}$ ft/sec

12. a) $\frac{9}{8}$ b) DNE c) 0 d) 0 e) 0

f) DNE or ∞ g) 2

13. $c = \frac{11}{2}$

14. f is left continuous at 0 but not right cont.

15. At $x=0$, f has a vertical asymptote

$$\lim_{x \rightarrow 0} f(x) \text{ DNE}$$

At $x=-2$, f has a hole, the limit exists but $f(-2)$ is not defined

$$\text{At } x=5 \quad \lim_{x \rightarrow 5^-} f(x) = 28 \quad \lim_{x \rightarrow 5^+} f(x) = 6 \quad \text{so}$$

$\lim_{x \rightarrow 5} f(x)$ does not exist.

Note: f is continuous at $x=1$.

16 a) 1

b) e

c) $-\infty$

d) $+\infty$

e) $\sqrt[5]{7}$

f) 5