

Mathematics 114 Spring 2007 – Review for Test 2

1. Sketch the graph of $f(x) = \begin{cases} 2x, & x < 3 \\ x^2, & x \geq 3 \end{cases}$.

2. Find the horizontal and vertical asymptotes of the following.

(a) $f(x) = \frac{6 - 3x^2}{x^2 - 4x - 5}$

(b) $f(x) = \frac{4x^3}{x^2 - x - 5}$

(c) $f(x) = \frac{1}{2x^2 + 7}$

3. Find the equation of the line which is perpendicular to the line $y = 2x - 5$ and passes through the point $(4, 3)$.

4. Find the inverse of $f(x) = \frac{1}{4}\sqrt[3]{x-2}$.

5. Find the zeroes of the following.

(a) $f(x) = 36x^2 - 24x$

(b) $f(x) = \frac{2x-9}{x^2-1}$

(c) $f(x) = 3x^3(x-1) + 6x(x-1)^2$

6. Rewrite $\ln\left(\frac{(x-1)^2(y-2)^4}{z(w-4)}\right)$ as four logarithms.

7. Write $2\ln x - 3\ln y$ as a single logarithm.

8. Compute or simplify the following (calculator answers are not sufficient).

(a) $\log_4 16$

(b) $\log_5 \frac{1}{25}$

(c) $\log_{10} \frac{1}{\sqrt[4]{10}}$

(d) $\log_2 120 - \log_2 15$

(e) $\ln e - \ln \sqrt{e}$

(f) $\ln(-2)$

(g) $(e^{-x})^2$

(h) $\frac{e^{3x}e^{9x}}{e^{5x}}$

(i) $e^{\ln x + \ln(x+1)}$

9. Solve the following equations.

(a) $e^x = 2$

(b) $\ln x = 2$

(c) $3^x = 2$

(d) $3e^x - 2 = 0$

(e) $3\ln 2x - 4 = 2$

(f) $3^{(4x-1)} = 6$

(g) $\log_2(x-1) = 7$

(h) $\frac{4}{1+3e^{-x}} = 6$

(i) $\frac{1+\ln x}{2} = 7$

10. Convert the following radian measures to degrees.

(a) 2π

(b) 3π

(c) $\frac{3\pi}{2}$

(d) π

(e) $\frac{\pi}{2}$

(f) $\frac{5\pi}{2}$

(g) $\frac{5\pi}{6}$

11. Convert the following degree measures to radians.

(a) 30°

(b) 45°

(c) 60°

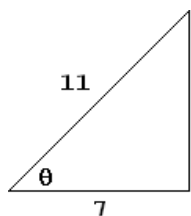
(d) 90°

(e) 180°

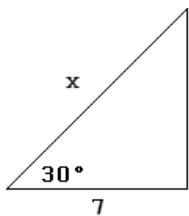
(f) 720°

(g) 75°

12. For the triangle given below, find all six trigonometric functions.



13. Suppose that $\sin \theta = 5/7$. Find $\tan \theta$. (Assume $0 < \theta < 90^\circ$.)
14. Suppose that $\cot \theta = 3$. Find $\cos \theta$. (Assume $0 < \theta < 90^\circ$.)
15. Find x .



16. Find the following without a calculator.

(a) $\sin 30^\circ$ (b) $\cos \frac{\pi}{6}$ (c) $\cos \frac{\pi}{2}$ (d) $\sec 60^\circ$ (e) $\sin(-\frac{\pi}{6})$ (f) $\sin 83\pi$ (g) $\tan \frac{17\pi}{4}$

17. Use a calculator to find $\cos 73^\circ$ and $\tan \frac{\pi}{5}$.

18. List 5 values of θ for which $\sin \theta$ is 0.

19. List 5 values of θ for which $\cos \theta$ is 0.

20. The population of a certain county (in thousands) is estimated by $P(t) = 110e^{k(t-2000)}$ where t is the year, and k is a constant. In 1980 the population was 74000. Use this information to find k , and predict the population in 2010.

21. Radioactive iodine has a half-life of 59 days. This means that after 59 days, half of the original amount of iodine will have decayed, and only half of the initial amount will remain. Suppose we start with 100 grams of radioactive iodine. The amount of radium that will be left after t days is given by

$$Q(t) = 100(1/2)^{t/59}.$$

- (a) How much will remain after 200 days?
- (b) How long will it take until there is only one gram remaining?
22. Suppose you are standing 100 feet from a tall building, and you measure that the angle of elevation from where you are standing to the top of the building is 75° . How high is the building?
23. Sketch the graphs $\sin x$, $\cos x$, and $\tan x$.