

1. (2 pts) Factor.

$$x^2 - 2x - 15 =$$

2. (4 pts) Simplify as much as possible (assume $x \neq \pm 2$).

$$\frac{4x}{x^2 - 4} - \frac{2}{x + 2} =$$

3. (4 pts) Simplify as much as possible.

(a) $\left(\frac{4}{25}\right)^{-1/2} =$

(b) $\frac{\sqrt[3]{a^7b}}{\sqrt[3]{ab^4}} =$

4. (4 pts) (a) (1 pt) Find the distance between the points $(0, 2)$, $(2, -2)$. (OK to leave answer as a square-root.)

- (b) (3 pts) Find the equation of the line that contains the points $(0, 2)$, $(2, -2)$.

5. (6 pts) Sketch the graph of each of the following functions and mark the coordinates of axis intercepts.

(a) $f(x) = 3 - x^2$

(b) $g(x) = 2x - 3$

6. (6 pts) True or False? Assume a, b are positive real numbers. Circle "True" if the equality holds for all a, b . Otherwise, circle "False".

$$\sqrt{a^2 + b^2} = a + b$$

True False

$$\frac{1}{a} + \frac{1}{b} = \frac{a+b}{ab}$$

True False

$$\frac{1}{a+b} = \frac{1}{a} + \frac{1}{b}$$

True False

$$\ln(a+b) = \ln a + \ln b$$

True False

$$\ln(a^b) = b \ln a$$

True False

$$\sec^2 a = 1 + \tan^2 a$$

True False

7. (6 pts) Fill in the exact values:

$$\cos(\pi/3) =$$

$$\tan(5\pi/4) =$$

$$\sin^{-1}(1) =$$

$$\log_{10}(1000) =$$

$$\ln\left(\frac{1}{e^2}\right) =$$

$$\log_3(\sqrt{3}) =$$

8. (6 pts) Consider the functions $f(x) = \sqrt{4-x^2}$ and $g(x) = x^2 + 2$.

(a) (2 pts) Find the domain of the function $f(x)$.

(b) (2 pts) Find a formula for the composition $(g \circ f)(x)$.

(c) (2 pts) Compute and simplify the expression for $\frac{g(x+h)-g(x)}{h}$.

9. (12 pts) Find all solutions of the following equations (3 pts each):

(a) $x^3 - 5x^2 + 6x = 0$

(b) $5 \cdot (3^{2x}) = 7$

Leave your answer as a logarithm for this one.

(c) $2 \cos x + 1 = 0$

OK to find all solutions $x \in [0, 2\pi]$ for this one.

(d) $ax^2 + bx + c = 0$

I want to check you know the quadratic formula.

10. (4 pts) In the right-angle triangle $\triangle ABC$ the right angle is at B and the sides BA and BC have lengths 3cm and 4cm, respectively. Let D and E be points on the sides BA and BC , respectively, so that the line DE is parallel to AC and the segment AD has length of 1cm. What is the length of the segment DE ?